NAVAIR 00-80T-104

NATOPS LANDING SIGNAL OFFICER MANUAL

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ISSUED BY AUTHORITY OF THE CHIEF OF NAVAL OPERATIONS AND UNDER THE DIRECTION OF THE COMMANDER, NAVAL AIR SYSTEMS COMMAND.

DEPARTMENT OF THE NAVY
NAVAL AIR SYSTEMS COMMAND
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1 May 2009

LETTER OF PROMULGATION

1. The Naval Air Training and Operating Procedures Standardization (NATOPS) Program is a positive approach toward improving combat readiness and achieving a substantial reduction in the aircraft mishap rate. Standardization, based on professional knowledge and experience, provides the basis for development of an efficient and sound operational procedure. The standardization program is not planned to stifle individual initiative, but rather to aid the Commanding Officer in increasing the unit's combat potential without reducing command prestige or responsibility.

2. This manual standardizes ground and flight procedures but does not include tactical doctrine. Compliance with the stipulated manual requirements and procedures is mandatory except as authorized herein. In order to remain effective, NATOPS must be dynamic and stimulate rather than suppress individual thinking. Since aviation is a continuing, progressive profession, it is both desirable and necessary that new ideas and new techniques be expeditiously evaluated and incorporated if proven to be sound. To this end, Commanding Officers of aviation units are authorized to modify procedures contained herein, in accordance with the waiver provisions established by OPNAV Instruction 3710.7, for the purpose of assessing new ideas prior to initiating recommendations for permanent changes. This manual is prepared and kept current by the users in order to achieve maximum readiness and safety in the most efficient and economical manner. Should conflict exist between the training and operating procedures found in this manual and those found in other publications, this manual will govern.

3. Checklists and other pertinent extracts from this publication necessary to normal operations and training should be made and carried for use in naval aircraft.

4. Per NAVAIRINST 13034.1 series, this flight clearance product provides NAVAIR airworthiness certification subsequent to design engineering review. It does not authorize aircraft system modification, nor does it satisfy NAVAIR requirements for configuration management. Refer to OPNAVINST 4790.2 series for policy guidance on configuration management and modification authority.

D. E. GADDIS
Rear Admiral, United States Navy
By direction of
Commander, Naval Air Systems Command

INTERIM CHANGE SUMMARY

The following Interim Changes have been cancelled or previously incorporated into this manual.

INTERIM CHANGE NUMBER(S)	REMARKS/PURPOSE
1 thru 12	Previously incorporated.

The following Interim Changes have been incorporated into this Change/Revision.

INTERIM CHANGE NUMBER(S)	REMARKS/PURPOSE
13	Transition Qualification Limitations

Interim Changes Outstanding — To be maintained by the custodian of this manual.

INTERIM CHANGE NUMBER	ORIGINATOR/DATE (or DATE/TIME GROUP)	PAGES AFFECTED	REMARKS/PURPOSE

RECORD OF CHANGES

Change No. and Date of Change	Date of Entry	Page Count Verified by (Signature)

LIST OF EFFECTIVE PAGES

Effective Pages	Page Numbers
Original	1 (Reverse Blank)
Original	3 (Reverse Blank)
Original	5 (Reverse Blank)
Original	7 (Reverse Blank)
Original	9 (Reverse Blank)
Original	11 thru 17 (Reverse Blank)
Original	19 thru 25 (Reverse Blank)
Original	1-1 thru 1-7 (Reverse Blank)
Original	2-1 thru 2-3 (Reverse Blank)
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Original	3-1 thru 3-7 (Reverse Blank)
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LIST OF ABBREVIATIONS AND ACRONYMS

A

A/O. Air Officer.

ACLS. Automatic carrier landing system.

ADRL. Automatic distribution requirements list.

AFGT. Advanced formal ground training.

AGO. Arresting Gear Officer.

ALB. Aircraft launch bulletin.

AOA. Angle of attack.

APARTS. Automated performance assessment and readiness training system.

APC. Approach power compensator.

ARB. Aircraft recovery bulletin.

ASR. Surveillance approach.

C

CAFSU. Carrier and field service unit.

CAG. Commander, Air Group.

CARQUAL. Carrier qualification.

CAT. Clear air turbulence.

CAT. Category.

CATCC. Carrier air traffic control center.

CCA. Carrier controlled approach.

CDP. Cross deck pendant.

CO. Commanding officer.

COD. Carrier on-board delivery.

CQ. Carrier qualifications.

CV. Aircraft carrier.

CV/N. Conventional/nuclear aircraft carrier.

CVW. Carrier Air Wing.

D

DLC. Direct lift control.

E

EMCON. Emission control.

F

FCLP. Field carrier landing practice.

FDHDIP. Flight Deck Hazardous Duty Incentive Pay.

FGT. Formal ground training.

FLOLS. Fresnel lens optical landing system.

FRS/TRACOM. Fleet replacement squadron/ training command.

H

H/E. Hook-to-eye.

HTD. Hook touchdown.

HTDP. Hook touchdown point.

HUD. Heads-up display.

I

ICO. In the case of.

IFF. Identification friend or foe.

IFGT. Initial formal ground training.

IFLOLS. Improved fresnel lens optical landing system.

ILARTS. Integrated launch and recovery television system.

ISIS. Integrated shipboard information system.

IVN. Integrated voice network.

L

LA. Landing area.

LSO. Landing signal officer.

M

MOVLAS. Manually operated visual landing aid system.

MRC. Maintenance requirement card.

MRT. Military rated thrust.

N

NATOPS. Naval air training and operating procedures standardization.

NFO. Naval flight officer.

NORDO. No-radio.

O

ODCR. Officer data control report.

OLS. Optical landing system.

OTC. Officer in tactical command.

P

PLAT. Pilot landing aid television.

PWA. Printed Wiring Assembly.

R

RHW. Recovery headwind.

S

SAR. Search and rescue.

SATCC. Shipboard air traffic control communication.

SME. Subject matter expert.

SNA. Student Naval Aviator.

SOTS. Stabilized optics tables.

SSTS. Ship's service telephone system.

T

T/M/S. Type/model/series.

TACAN. Tactical air navigation system.

UHF. Ultrahigh frequency.

V

V/STOL. Vertical/short takeoff and landing.

VFR. Visual flight rules.

VHF. Very high frequency.

VMC. Visual meteorological conditions.

W

WOD. Wind over deck.

PREFACE

SCOPE

NATOPS manuals are issued by the authority of the Chief of Naval Operations and under the direction of the Commander, Naval Air Systems Command in conjunction with the Naval Air Training and Operating Procedures Standardization (NATOPS) program. NATOPS publications provide the best available operating instructions for most circumstances. However, no manual can cover every situation or be a substitute for sound judgment; operational situations may require modification of the procedures contained therein. Read these publications from cover to cover. It is your responsibility to have a complete knowledge of their contents.

Note

See Chapter 1 for more information on the scope and purpose of this manual, and for any special requirements or procedures that compliment those contained in this preface.

DETERMINING THE CURRENT VERSION OF THIS PUBLICATION

The current versions of NATOPS publications are listed in the NATOPS Status Report which is available online at https://airworthiness.navair.navy.mil. Upon receiving a copy of a NATOPS, consult the NATOPS Status Report to determine its current configuration (through the latest revision, change, and interim change). Before using this publication, users shall ensure that they have the current version of it.

OBTAINING COPIES OF THIS PUBLICATION

One-Time Orders

Copies of this publication and the current changes thereto may be ordered from the Naval Logistics Library (NLL) using NAVICP Pub 2003, which is available online at https://nll.ahf.nmci.navy.mil, or procured through the supply system in accordance with NAVSUP P-409 (MILSTRIP/MILSTRAP). This manual is also available in pdf format and may be viewed on, and downloaded from, the NATEC or AIRWORTHINESS websites, www.mynatec.navy.mil or https://airworthiness.navair.navy.mil, respectively.

Note

- When the current revision of a publication is ordered through NLL or NAVSUP, copies of all active changes to the publication will be forwarded along with it. The printed changes to a revision need not be ordered in addition to ordering the revision.

- An order for a publication that exceeds the maximum order quantity posted on the NLL website will be filled not to exceed the maximum order quantity. Additional orders will be required in order for an activity to receive more than the posted maximum order quantity of a publication.

- Interim changes to NATOPS publications are not stocked within the NLL or NAVSUP systems and must be obtained separately. Active interim changes to NATOPS publications are published in electronic media only and most are available online at www.mynatec.navy.mil and https://airworthiness.navair.navy.mil for viewing and downloading.

Automatic Distribution

NATEC automatically sends copies of new revisions and changes to users whose NAVAIR publication requirements are maintained within its Automatic Distribution Requirements List (ADRL) database. Detailed procedures for establishing and maintaining an ADRL account are contained in NAVAIR technical manual 00-25-100 work package (WP) 017-00, which is available online at https://mynatec.navair.navy.mil.

Note

- When a user's ADRL account has not been updated within the last 12 months, all automatic distribution to the user will be suspended until the account has been updated.
- To avoid the gross cost and delivery inefficiencies that have resulted from excessive or insufficient distributions, the NATOPS Program Manager has been granted authority to adjust the automatic distribution quantities of NATOPS publications. Units requiring large or unusual distribution quantities of NATOPS publications should confirm them with the NATOPS Program Manager in advance of distribution to ensure that the quantities they will receive will be acceptable.

KEEPING THIS PUBLICATION CURRENT

To be effective, NATOPS publications must be kept current through an active manual change program. Corrections, additions to, deletions from, and suggestions for improvement of contents should be submitted as NATOPS change recommendations as soon as possible after discovery. Suggestions for improvement should avoid vague and generalized language and shall be worded as specifically as possible. Detailed standards for NATOPS publications are found in MIL-DTL-85025B(AS), which is available online at https://airworthiness.navair.navy.mil. Change recommendations may be submitted by anyone in accordance with OPNAVINST 3710.7. All users are encouraged to contribute to the currency, accuracy, and usefulness of this and other NATOPS publications by submitting timely change recommendations for these publications.

SUBMITTING CHANGE RECOMMENDATIONS

Types of Change Recommendations

Change recommendations should be submitted as URGENT, PRIORITY or ROUTINE. Urgent and Priority change recommendations are changes that cannot be allowed to wait for implementation until after the next review conference. These usually involve safety-of-flight matters. Some priority change recommendations may be upgraded to URGENT by NAVAIR (AIR-4.0P), Program Class Desk or the NATOPS Model Manager following receipt and initial review.

Submitting Change Recommendations to NATOPS Publications

While each type of change recommendation is processed and approved differently, the preferred means of submitting all of them is through the Airworthiness Issues Resolution System (AIRS) which may be accessed online at https://airworthiness.navair.navy.mil, or on SIPRNET at https://airworthiness.navair.navy.smil.mil for classified or otherwise sensitive change recommendations. AIRS provides the fastest and most efficient means of processing and resolving NATOPS change recommendations. It expedites distribution of the URGENT and PRIORITY change recommendations to those who need to act on them and compiles the ROUTINE change recommendations into their respective review conference agenda packages.

In the event that a worldwide web connection to AIRS is not available, PRIORITY change recommendations may be submitted via Naval message in accordance with OPNAVINST 3710.7. When AIRS is not accessible, ROUTINE

change recommendations may be submitted on a NATOPS/Tactical Change Recommendation (Form OPNAV 3710/6), a copy of which is contained within the preface of this manual. The completed change recommendations forms for changes to this manual should be sent by U.S. Mail to the NATOPS Model Manager of this publication at:

Message PLAD: LSO School NAS Oceana VA

Address: Officer In Charge, LSO School
Attn: NATOPS Program Manager
841 F Ave., Bldg 150
Virginia Beach, VA 23460

Telephone: (757) 433−2515 DSN: 433−2515

Email address: staff@lsoschool.org

ISSUING UPDATES TO NATOPS PUBLICATIONS

Interim Changes

Approved NATOPS urgent and priority change recommendations are issued via Naval messages and may involve making pen-and-ink entries and/or replacing pages. Copies of interim change messages and their replacement pages are posted on the NATEC website at www.mynatec.navy.mil, https://airworthiness.navair.navy.mil, or https://airworthiness .navair.navy.smil.mil for viewing and downloading. Interim change replacement pages are always issued in electronic format and are not distributed in paper format except under unusual circumstances. Following the incorporation of an interim change into this publication, its entry should be recorded on the Interim Change Summary page within this publication.

Revisions, Changes and Errata

Routine change recommendations are compiled into a conference agenda and held for review at the next NATOPS review conference for this publication. Change recommendations approved by the review conference are published by the NATOPS Model Manager in a review conference report and then incorporated into a revision or change to this manual, copies of which are mailed on paper and/or electronic media to users that have a listed requirement for it in the NATEC ADRL system database. Copies of most unclassified publications are also posted on the NATEC and Airworthiness websites. When printing errors are found in publications, errata may also be prepared and posted and/or distributed in electronic or paper form in the same manner as for revisions and changes. After incorporating a change or errata into this publication, you should page check and record its entry on the Record of Changes page within this publication.

CHANGE SYMBOLS

Revised text is indicated by a black vertical line in the right margin of the page, like the one printed next to this paragraph. The change symbol shows where there has been a change. The change might be material added or information restated. A change symbol in the margin by the chapter number and title indicates a new or completely revised chapter. Change symbols are not normally used to mark the locations of deleted information.

SPECIAL TERMINOLOGY IN NATOPS PUBLICATIONS

The following special terminology and meanings apply to the contents of this and other NATOPS publications:

Warnings, Cautions, and Notes

The following definitions apply to WARNINGS, CAUTIONS, and Notes:

WARNING

An operating procedure, practice, or condition, etc., that may result in injury or death, if not carefully observed or followed.

CAUTION

An operating procedure, practice, or condition, etc., that may result in damage to equipment if not carefully observed or followed.

Note

An operating procedure, practice, or condition, etc., that is essential to emphasize.

Requirement for compliance.

1. "Shall" is used only when application of a procedure is mandatory.
2. "Should" is used only when application of a procedure is recommended.
3. "May" and "need not" are used only when application of a procedure is optional.
4. "Will" is used only to indicate futurity, and never to indicate any degree of requirement for applicability of a procedure.

Requirement for landing aircraft.

1. Land immediately is self-explanatory. (Applicable to helicopters and other VTOL aircraft.)
2. Land as soon as possible means land at the first landing site at which a safe landing may be made.
3. Land as soon as practical means extended flight is not recommended. The landing and duration of flight is at the discretion of the pilot in command.

PART I

The Landing Signal Officer

CHAPTER 1

Introduction

1.1 PURPOSE

This manual is a single source of LSO information for LSOs, unit commanders, and air crewmembers that contains descriptions of visual landing aids, command relationships, a compendium of LSO-related policies and responsibilities, pilot and LSO training requirements and qualifications, descriptions of visual landing aids, and LSO procedures for recovering fixed-wing non-V/STOL aircraft aboard CV and CVN-class ships.

1.2 SCOPE

In addition to an introduction, Part I of this manual establishes LSO command relationships with type commanders, staffs, CV(N) commanding officers, air wing commanders, squadron commanding officers, detachment Officers-in-Charge, and Air Department personnel.

It also describes LSO levels of designation, and establishes a comprehensive training program for fixed-wing, non-V/STOL LSOs. Part II provides detailed descriptions of the LSO workstation equipment ashore for FCLP and aboard ship for CV landings. Parts III and IV contain shorebased and shipboard requirements and procedures for both normal and emergency situations. Parts V and VI provide policies and LSO procedures for extreme weather operations and establish standard terminology for radio communications. Part VII addresses NATOPS evaluations of LSOs, pilot performance records, and LSO aircraft mishap statements.

Procedures for V/STOL LSOs are not within the scope of this manual and can be found in NAVAIR 00-80T-111 (V/STOL Shipboard and Landing Signal Officer NATOPS Manual).

1.3 RESPONSIBILITIES FOR THIS MANUAL

1.3.1 NATOPS Advisory Group

NATOPS Advisory Group member relationships, responsibilities and procedures are contained in OPNAVINST 3710.7. The following are the members of the NATOPS Advisory Group for this manual:

Commandant of the Marine Corps	CMC (SD)
Commander, Naval Air Force Reserve	COMNAVAIRFORES (N42)
Commander, Naval Air Forces	COMNAVAIRFOR (N455)
Commanding General, U.S. Marine Forces Command	COMMARFORCOM (DSS)
Commanding General, U.S. Marine Forces Pacific	COMMARFORPAC (SAFETY)
Commanding General, Fourth Marine Air Wing	CG FOURTH MAW (DOSS)
Commander, Naval Air Systems Command	COMNAVAIRSYSCOM (4.0P/PMA-251)
Commander, Naval Safety Center	COMNAVSAFECEN (Code 11)
Commander, Naval Air Training Command	CNATRA (N31)

In accordance with OPNAVINST 3710.7, each commander shall designate his NATOPS Advisory Group representative in writing and forward copies of this correspondence to COMNAVAIRFOR (N455) and NAVAIR (AIR-4.0P) on each occasion when a new representative is assigned.

1.3.2 NATOPS Cognizant Command

Commander Naval Air Forces is assigned as the NATOPS Cognizant Command and is responsible for the contents and maintenance of this manual in accordance with OPNAVINST 3710.7.

1.3.3 NATOPS Model Manager

The NATOPS Model Manager for this manual as listed in the Preface of this manual, is responsible for conducting periodic reviews of this manual in accordance with OPNAVINST 3710.7.

1.4 RELATED PUBLICATIONS

1.4.1 Complementary Publications

The following publications directly complement the information presented in this manual. LSOs shall be thoroughly familiar with the contents of this these documents. These publications are available on the web at https://www.mynatec.navy.mil, https://airworthiness.navair.navy.mil and/or www.lsoschool.org.

1. NAVAIR 00-80T-105 (CV NATOPS Manual).
   a. An aircraft carrier flight operations manual which contains landing patterns and procedures in Chapter 5.
2. Aircraft NATOPS Flight Manuals.
   a. Each Aircraft Flight Manual contains flying characteristics, limitations, and carrier recovery procedures for that individual aircraft.
3. Aircraft Recovery Bulletins (ARBs):
   a. ARB 10-10-series. General recovery information that is required reading for all personnel concerned with aircraft recovery operations.
   b. ARB 0-11-series. Contains current status of all ARBs.
   c. ARB 12-12-series. Specifies deck configuration for barricade engagements.
   d. ARB 20- through 39-series. Covers various types of arresting gear, engaging speeds, weights, etc.
   e. ARB 63-12-series. Contains improved Fresnel lens settings for all aircraft and CV(N) combinations, and is required reading for all pilots.
4. NAVAIR 00-80T-120 CV Flight/Hangar Deck NATOPS Manual.

1.4.2 Respective Type Commander Instructions:

CNAFINST 1520.6 LSO Instruction

CNAFINST 3500.2 PRI−A Instruction

CNAFINST 3500.21 LSO Evaluation During COMPTUEX

CNAFINST 3500.71 Flight Deck Certification Instruction

CNAFINST 3740.1 CQ instruction CNATRAINST 3740.9

CNATRA CQ Instructions (Confirm actual titles and not subjects)

1.4.3 Other Relevant Publications For LSOs

OPNAVINST 7220.4

Flight Deck Hazardous Duty Incentive Pay (FDHDIP)

MCO 1540.32 Marine LSO Instruction

1.5 ROLE OF LANDING SIGNAL OFFICER

The landing signal officer's primary responsibility is the safe and expeditious recovery of non-V/STOL fixed-wing aircraft aboard ship. The employment of high-performance aircraft and the necessity for all weather operations have placed ever increasing demands on the LSO's skill and judgment. Through training and experience, he is capable of correlating factors of wind, weather, aircraft capabilities, ship configuration, pilot experience, etc., in order to provide optimum control and assistance in aircraft landings. The LSO is also directly responsible for training pilots in carrier landing techniques. In this regard, he must constantly monitor pilot performance, schedule and conduct necessary ground training, counsel and debrief individual pilots, and certify their carrier readiness and qualification. The pilot and LSO form a professional and disciplined team, both ashore and afloat. The LSO strives to develop the pilot's confidence, judgment, maximum effort, technical proficiency, and personal interest. The pilot must rely on the LSO's experience and ability to prepare him for optimum effectiveness as a carrier pilot.

1.6 COMMAND RELATIONSHIPS AND RESPONSIBILITIES OF THE LANDING SIGNAL OFFICER

1.6.1 Type Commander

The type commander LSO shall act as a coordinator in all matters concerning the readiness, training, and qualifications of LSOs under his cognizance; shall work with the LSO training model manager in all matters concerning LSO readiness and training; and shall be responsible for the nomination of qualified LSOs to the Chief of Naval Personnel or Commandant of the Marine Corps for future assignment. The senior LSO in each subordinate command is responsible for informing the type commander or Chief of Naval Air Training of the status of LSO training and qualifications. This report shall be submitted in accordance with Part VII, Chapter 10 of this manual.

1.6.2 LSO Training Model Manager

The officer in charge of the LSO School shall act as the LSO training and NATOPS model manager. As such, he will be responsible for the following major training areas:

1. Developing, implementing, monitoring, and updating educational media materials for all LSO training.
2. Conducting IFGT, FRS/TRACOM FGT, and AFGT.
3. Monitoring training levels of all U.S. Navy and Marine Corps LSO personnel.
4. Acting as the SME representative to all research and development projects relating to LSO training and equipment.
5. Monitoring status of shipboard LSO equipment stations and providing inputs to appropriate fleet type commander LSOs.
6. Acting as a liaison between pertinent commands concerning LSO matters.

1.6.3 Ship/Air Wing Commanding Officer

When embarked, the LSO is responsible to the Captain and Air Wing Commander for the safe and expeditious recovery of aircraft. The LSO shall inform the Captain and Air Wing Commander through the Air Officer of any

conditions that might interfere with recovery such as malfunctions of equipment, improper deck configuration, adverse weather and wind, or sea conditions. It is the LSO's responsibility to make appropriate recommendations to the Captain and Air Wing Commander based on his evaluation of the operating environment.

1.6.3.1 Air Officer

When embarked, the LSO performs his platform duties under the supervision of the Air Officer. It is incumbent on the LSO to establish a close working relationship with the Air Officer, to include periodic discussions regarding mutual expectations and delegation of responsibilities in the recovery of aircraft.

1.6.4 Air Wing Commander

The air wing staff LSO is responsible to the Air Wing Commander for the following:

1. The operational readiness of all assigned squadrons and detachments pertaining to FCLP and carrier landing operations.

2. Coordination and supervision of the training and employment of all LSOs within the air wing. He will ensure that a high level of proficiency is maintained by the administration of an LSO training program. It is incumbent upon the air wing staff LSO to establish training goals and pursue their accomplishment through field and shipboard training.

3. Provision of trend analysis forms and written commentary where applicable to the Commanding Officer of a detachment's parent squadron following each operating period. It is intended that all pilot carrier performance be observed, evaluated, and critiqued by the host air wing regardless of the unit's tenure aboard ship or the frequency of its operations.

4. Ensuring that a separate COD log is maintained in Air Operations, and that all landings to the carrier by COD aircraft are recorded and debriefed. If operational tempo does not facilitate a face-to-face debrief with the pilot, the pass shall be recorded in the COD logbook for retrieval and subsequent debrief by the squadron LSO.

1.6.5 Squadron Commanding Officer

The squadron LSO advises and makes recommendations to the squadron commander pertaining to:

1. The state of pilot training

2. Any unsafe tendencies of individual pilots

3. The state of assistant LSO assignment and training

4. The latest technical developments of appropriate type aircraft, ship configurations, and equipment which concern the recovery of aircraft.

For CV detachments, the parent squadron LSO shall ensure that the level of readiness of the detachment to be assigned meets the requirements outlined in this manual. Recipient LSOs should, as far as practicable, observe all detachment performance of FCLP prior to embarkation.

It is incumbent on the Commanding Officer to fully support the LSO training program.

Commanding officers should ensure that LSOs receive flight time commensurate with other squadron pilots.

1.7 LSO DESIGNATIONS

1.7.1 LSO Designation Category

1. Field LSO. This qualification reflects the individual's ability to control carrier qualified aviators in the specific model aircraft the LSO is carrier qualified in during FCLP. If also squadron qualified, this qualification reflects the individual's ability to control carrier qualified aviators in all of the air wing aircraft during FCLP. Further, he is considered qualified to maintain and interpret LSO logs and records of FCLP periods conducted for the purpose of making recommendations to the commanding officer regarding pilot readiness for CV landings.

2. Squadron LSO. This qualification reflects the individual's ability to control carrier qualified aviators in the specific model aircraft the LSO is carrier qualified in aboard ship in day and night conditions and operate the MOVLAS in day conditions. Further, he is considered qualified to maintain and interpret LSO logs and records and make recommendations to the commanding officer concerning individual pilot qualifications. It is the responsibility of the air wing staff LSO to recommend the squadron LSO designation.

3. Wing LSO. This qualification reflects an individual's ability to control carrier qualified aviators in all of the air wing aircraft during FCLP and aboard ship in all conditions and operate the MOVLAS in both day and night conditions. It also reflects the individual's ability to administer, instruct, and supervise carrier qualifications for transition and requalifying pilots during daytime conditions. He demonstrates the ability to function as an LSO watch team supervisor and effectively teach carrier aviation skills to junior aviators. Designation as a squadron LSO and completion of Initial Formal Ground Training shall be required prior to designation as a Wing LSO. It is the responsibility of the air wing staff LSO to recommend designation as a Wing LSO.

4. Training LSO. This qualification reflects the individual's ability to control all pilots, including student and replacement pilots, in the specific model aircraft the LSO is carrier qualified in, both during FCLP and aboard ship. Prior to designation as a Training LSO, a Wing Qualified LSO assigned to a training squadron may control all aviators in the specific model aircraft the LSO is carrier qualified in during FCLP. It also reflects the individual's ability to administer, instruct, and supervise carrier qualifications for undergraduate, initial, transition, and requalifying pilots. Designation as a Wing LSO and completion of the Instructor Training Course shall be required prior to designation as a Training LSO. It is the responsibility of the senior training LSO to recommend designation as a Training LSO.

5. Staff LSO. This qualification reflects the individual's ability to control all aviators in all aircraft during FCLP and aboard ship under all operating conditions. Further, it reflects attainment of the highest level of qualification and experience gained as a result of performance in subordinate categories. The Staff LSO acts as an advisor to the Air Wing Commander, Carrier Commanding Officer and Flag Officers in all matters pertaining to carrier aviation. Additionally, he acts as a mentor to subordinate LSO's and is responsible for the development of those LSO's. Designation as a Training LSO and completion of the Staff LSO Course shall be required prior to designation as a Staff LSO. It is the responsibility of the Air Wing Commander to recommend designation as a Staff LSO.

1.7.2 LSO Trainee Nomination Procedures

The decision to recommend initial LSO nomination rests with the individual's Commanding Officer, based upon the recommendation of the senior cognizant LSO. A letter recommending nomination as an LSO trainee shall be submitted by the Commanding Officer to the type commander via the Air Wing Commander, Training Wing Commander, or Marine Aircraft Group Commander.

1.7.3 Upgrading Procedures

When a letter requesting LSO nomination, qualification, or qualification upgrade is forwarded to the first endorser, the LSO is authorized to control aircraft in that capacity while approval from the type commander is pending. Copies of the type commander's approval letter shall be forwarded to Bureau of Naval Personnel (PERS 433) or Commandant of the Marine Corps (Code MMOA2) for inclusion into the officer's service record.

1.8 LSO SENIORITY

LSO seniority will be determined by level of LSO designation, with LSO School OIC, TYCOM LSOs, and CNATRA LSO being the highest level of designation, followed by staff LSO, Training LSO, Wing LSO, and Squadron LSO in that order. In FRS and training command squadrons only, the training LSO designation shall be used to determine LSO seniority, regardless of squadron or wing designation. In situations involving two or more individuals with the same level of designation, seniority of designation date will determine LSO seniority unless modified by the COMNAVAIRFOR, Air Wing Commander, or Commanding Officer.

All LSOs within the air wing are operationally subordinate to the air wing staff LSO.

1.9 ASSIGNMENT

The type commander LSO shall act as coordinator in all matters concerning the readiness, training, qualification, and assignment of LSOs under their cognizance. The type commander LSO billet shall be filled by a current staff qualified LSO with a minimum of 90 days embarked as a staff LSO. Marine air wing staff LSO billets should be filled by experienced and current wing designated LSOs.

The Officer in Charge LSO School billet shall be filled by a current staff qualified LSO with a minimum of 90 days embarked as a staff LSO.

The numbers contained in Figure 1-1 are the recommended minimum LSO requirements. However, it should be recognized that practical maximums also exist because of variable operating tempos and corresponding training opportunities. Nomination of LSO trainees in excess of those indicated could result in reducing the overall experience level of LSOs in the future. Staff LSOs shall coordinate and limit the total number of LSOs per air wing in order to provide adequate training opportunities at the operational level.

1.10 FLIGHT DECK HAZARDOUS DUTY INCENTIVE PAY (FDHDIP)

Per CNAL 220935ZAPR99, LSOs are authorized to exceed the quotas listed in OPNAVINST 7220.4 to compensate individuals who are under instruction. All LSOs are considered to be “under instruction” until they become CVW staff qualified LSOs. LSOs that meet the requirements as set forth in OPNAVINST 7220.4 are entitled to FDHDIP, at no penalty to the command’s other quotas.

1.11 TRAINING REQUIREMENTS

See Chapter 2 for LSO training requirements. See Chapters 5 and 6 for pilot training requirements.

1.12 WAIVERS

Waivers to the requirements imposed by this manual must be approved in accordance with OPNAVINST 3710.7.

STAFF	QUALIFIED	IN TRAINING	TOTAL
TYCOM	1	—	1
LSO SCHOOL	4	—	4
CVW	3	—	3
TRAWING	1	—	1
MAW	1	—	1
CNATRA	2	—	2
OPERATIONAL SQUADRONS	**QUALIFIED**	**IN TRAINING**	**TOTAL**
VS/VAW/VFA	2	2	4
VAQ	2	1	3
VMAQ/VMFA/VMFA (AW)	1	1	2
VMFA (CV DEPLOYED)	2	2	4
VRC	1	1	2
VX (AS APPROPRIATE)	1	—	1
DETACHMENTS (CV DEPLOYED)	**QUALIFIED**	**IN TRAINING**	**TOTAL**
VMAQ/VRC	1	1	2
REPLACEMENT SQUADRONS	**QUALIFIED**	**IN TRAINING**	**TOTAL**
VFA	6	—	6
VMFAT	6	—	6
VAW	6	—	6
VAQ	5	—	5
VT*	6	—	6

*VT LSOs shall not be assigned more than 8 students per carrier detachment.

Note

The above numbers represent minimum recommended LSO minimum manning levels. Operational squadrons will normally exceed these minimums to maintain a quality LSO training program.

Figure 1-1. Recommended LSO Minimum Manning Levels

CHAPTER 2

LSO Training and Readiness

2.1 SELECTION OF LSO TRAINEES

Prospective LSOs are first tour pilots nominated by squadron commanding officers. When selecting candidates for LSO training, consideration should be given to motivation, aviation ability, and potential as an instructor. Candidates should also be identified early enough in their first operational tour to be given the opportunity to progress to wing qualification status before the end of that tour. Nominees should be sent to the U.S. Navy LSO School as soon as nominees have enough initial familiarization with the LSO trade to make the school a worthwhile experience.

Squadron commanding officers shall submit a letter of nomination for LSO training via the chain of command to their cognizant type commander for approval. Letters of nomination should include the following information:

1. Name, rank, SSN, designator, and date of rank
2. Date reporting/reported to squadron and rotation date as shown on latest ODCR
3. Total flight hours/hours in type
4. Total carrier landings day/night by type aircraft.

2.2 LSO TRAINING PROGRAM

The LSO training and qualification program consists of the following:

1. Ground training for LSO trainees and squadron LSOs
2. Initial field training prior to squadron LSO designation
3. IFGT prior to wing LSO designation
4. Shipboard training prior to squadron and wing LSO designation
5. Initial formal ground training and FRS/TRACOM formal ground training prior to training LSO designation
6. Advanced field and shipboard training prior to training LSO designation
7. AFGT prior to staff LSO designation.

2.2.1 Formal Ground Training

Initial, FRS/TRACOM, and advanced formal ground training shall be conducted by the U.S. Navy LSO School. Initial formal ground training should be completed prior to designation as a squadron LSO and shall be completed prior to designation as a wing LSO. FRS/TRACOM formal ground training should be completed prior to reporting to an FRS or training command squadron. Advanced formal ground training shall be completed prior to reporting to the carrier air wing commander's staff.

2.2.2 Field Training

Field training prior to designation as a squadron LSO shall be conducted under the supervision of a squadron, wing, or staff LSO. A training LSO shall supervise the advanced field training required for training LSO qualification.

2.2.3 Shipboard Training

Shipboard training pursuant to squadron, wing, or training LSO qualification shall be conducted under the supervision of a training or staff LSO. A designated staff LSO shall supervise the progress of a prospective staff LSO until the candidate has attained sufficient proficiency in controlling all assigned air wing aircraft for staff designation. In all cases, it is the responsibility of the senior designated LSO to evaluate the capabilities and progress of the LSO under training and report the same in accordance with Part VII, Chapter 10 of this manual.

2.2.4 Aircraft Crosstype Training

Each operational air wing should have staff LSO's with practical experience in each fixed wing aircraft in that air wing. As operational requirements dictate, designated staff and squadron LSO's should receive flight indoctrination in at least on additional type of aircraft assigned to is respective air wing. LSO cross-training is designed to improve LSO understanding of aircraft handling and performance characteristics primarily in the approach and landing phases. LSO exposure to the flight characteristics of aircraft other than his own has a positive effect on overall LSO expertise.

2.3 REQUIREMENTS FOR LSO DESIGNATION

The requirements for LSO qualification and designation are discussed in Part VII, Chapter 10 (NATOPS Evaluation) of this manual.

2.4 LSO CURRENCY REQUIREMENTS

The following criteria apply to qualified LSOs and are established to ensure minimum LSO proficiency for safe recovery operations:

LSO CURRENCY REQUIREMENTS	
PERIOD SINCE ACTING AS CONTROLLING LSO FOR CV RECOVERY OPERATIONS	REQUIRED ACTION PRIOR TO ACTING AS CONTROLLING OR BACKUP LSO FOR CV RECOVERY OPERATIONS
Up to 12 months	Discretion of senior LSO
Over 12 months	1. Control 80 field carrier landing practice (FCLP) landings or observe 30 CV landings; and 2. Control 20 CV landings under supervision of senior LSO. Senior LSO must be current to supervise currency training.

2.5 FACTORS AFFECTING LSO READINESS

1. The duties of the LSO require the same levels of mental alertness that are required of a naval aviator in actual control of aircraft. The LSO shall be a physically qualified (or waivered) designated naval aviator with a current Aeromedical Clearance Notice (up-chit, NAVMED 6410/2). Additionally, LSOs shall remain in full compliance with OPNAVINST 3710.7 series, paragraph 8.3.1, concerning personnel readiness and qualifications. There will be occasions when the LSO is physically fit for LSO duties but not for actual flight (e.g., sprained wrist). This requires an Aeromedical Clearance Notice for LSO Duties Only.

2. LSOs shall maintain flight proficiency in the carrier landing environment. Staff LSOs are the senior air wing subject matter experts in the fixed-wing recovery environment and therefore must fly with the air wing to be credible evaluators as well as to have first-hand knowledge of the conditions air wing pilots face during recovery operations. Consequently, staff LSO billets should be fully afforded adequate flight hours for proficiency.

2.6 TRAINING LSO CARRIER QUALIFICATION (CQ) REQUIREMENTS

In order to maintain proficiency in the carrier landing environment, Training LSOs shall receive carrier arrestments whenever possible. CV/N and FRS/TRACOM commanding officers shall ensure, as a minimum, Training LSOs receive six arrested landings every 6 months.

2.7 LSO TRAINER (DEVICE 2H111)

The Landing Signal Officer Trainer, Device 2H111, is operational at NAS Oceana. It simulates a fully functional LSO platform on a CVN-68 (Nimitz) or CVN 76 (Reagan) class CV, and employs models of virtually all current fleet aircraft. A wide variety of environmental conditions, operating parameters (including MOVLAS), and normal or emergency scenarios may be simulated to provide realistic individual LSO or LSO team procedural and proficiency training. The use of the trainer is highly recommended for LSO turnaround training on both a squadron and air wing level, to enhance the overall preparedness of LSO teams prior to embarked operations.

PART II

The LSO Workstation

CHAPTER 3
Shore-Based Workstation

3.1 GENERAL

Certain specific equipment and personnel shall be provided for both shore and shipboard operations so that an LSO can safely and efficiently perform his mission. Responsibility for the provision, maintenance, and proper functioning of the equipment rests with the air station's or ship's air department, as applicable. It is the LSO's responsibility to ascertain, before commencing operations, that all required equipment is available and operative.

3.2 MINIMUM EQUIPMENT FOR FIELD CARRIER LANDING PRACTICE (FCLP) OPERATIONS

3.2.1 Day FCLP

The minimum equipment and personnel required for day FCLP are:

1. Visual landing aid and necessary accessories, including waveoff pickle switch and press-on and release-off cut switch.
2. MOVLAS (available for at least one full FCLP period per pilot).
3. Communications: a UHF transceiver with extension speaker and microphone and guard transceiver capability.
4. Runway: a simulated carrier deck at or below 1,000 feet MSL field elevation.
5. Crew: a qualified LSO shall be on station for all FCLP operations. With more than two aircraft in an LSO controlled FCLP pattern, an individual to assist the controlling LSO should be provided.

3.2.2 Night FCLP

In addition to the items listed in the preceding paragraph, the following equipment and personnel are required for night FCLP:

1. Permanent, flush-deck lighting. Unless this system is installed, a minimum of 24 portable powered lights with suitable holders will be provided.
2. Aldis lamp for emergency use located at the LSO station.
3. Abeam position marker light located at the LSO station, visible abeam to the pilot.
4. Emergency arresting gear marker light.
5. Crew: With more than two aircraft in an LSO controlled FCLP pattern, an individual to assist the controlling LSO is required.

3.3 VISUAL LANDING AIDS

3.3.1 General

There are presently four optical landing aids used aboard naval air stations.

1. Mk 8 Fresnel lens
   a. Mod 0: Equipped with roll angle drive assembly
   b. Mod 1: Not equipped with roll angle drive assembly
2. MOVLAS (Mk 2 Mod 2)
3. Mk 14 Mod 0 improved Fresnel lens.

Note

Visual landing aids which are installed as a part of an air station's normal approach lighting and marking scheme may be configured to activate the runway waveoff light system (wheels up waveoff lights) whenever the lens waveoff lights are activated by the tower, wheels watch, or the LSO's pickle switch. Use of this configuration may not be suitable for conduct of FCLPs. Refer to NAVAIR 00-80T-114 (Air Traffic Control Manual).

3.3.2 Mk 8 Fresnel Lens Optical Landing System (FLOLS)

The Mk 8 Fresnel lens provides glidepath and trend information to a fixed wing pilot approaching the runway. The datum arms may be pinned inward against the power control unit when not in use. On/off and intensity controls are provided for independent control of source, datum, and combined cut and waveoff lights. A jackscrew and hand-crank on the front of the trailer base is used to adjust desired glideslope. A mirrored pole is provided with the unit to check glideslope settings. The Mk 8 Mod 0 is equipped with a roll angle assembly so that the unit may be used for continuous short-field arrestments with SATS systems. Aircraft Recovery Bulletin No. 80 series lists operating instructions and roll angle settings.

3.3.2.1 MK 8 Optical Characteristics

3.3.2.1.1 Effects of Temperature

The optical characteristics of the Fresnel lens vary appreciably with changes in internal cell temperature. If the lens temperature is allowed to vary beyond operational limits (97 ±7 °F), three effects will be observed:

1. As temperature varies, the size of the bar of light will appear to change as the image moves from the lens center to the transition line between cell assemblies. If the temperature is higher than operational temperatures, the bar of light at the center will appear smaller and bloom to a larger bar of light at the transition line between cells. At lower temperatures, the opposite will occur.
2. At extreme temperatures it is possible to get blank areas or double bars of light at or near the transition point between cells.
3. The light bar will be wider (i.e., less well-defined) at temperatures higher than design temperatures, and smaller at lower temperatures. Extremes in temperatures (below 90 °F or above 135 °F) will cause out of tolerance indications in PriFly and the FLOLS control room. Overtemperature may be caused by a failed thermal switch(es) causing the cell heaters to stay on, outside air temperature, or aircraft spotted with exhausts pointed near the lens. Since the actual Fresnel lens inside the cell assembly is made of plastic (Lucite), a metal frame (eggcrate) is bolted to the plastic Fresnel lens to support it and keep the lens from warping. The plastic Fresnel lens can be damaged resulting in transition problems if the eggcrate bolts are over-tightened or the clamps that hold the Fresnel lens in the cell are overtightened. Bad transition can usually be detected on deck, but you must be at least 80 feet away from the lens when viewing the display. Lens technicians can move the lens in pitch so all transitions can be viewed. All cells are interchangeable, so the best cells should be put in the center and adjacent positions. Lens technicians can determine the best cells with visual examination of the cell output and by performing the MRC for the Flip Test. If it is necessary to use the lens prior to complete warmup, pilots should be informed that there may not be a smooth transition of the ball between cells and that the ball may disappear as it traverses the junction between adjacent cells. No difficulty should be experienced when the ball is in the center of the cell.

3.3.2.1.2 Focal Point and Field of View

The inherent characteristic of the FLOLS display is a linear projected glideslope (i.e., the total beam height becomes wider as distance from the lens is increased, and that width increase is linear). The further a pilot is from the lens, the more difficult it is for the pilot to perceive changes in glideslope. The total glideslope vertical field composed of all five cells (Figure 3-1) is approximately 1.7° (each cell accounts for 20.45 minutes of arc or .34°).

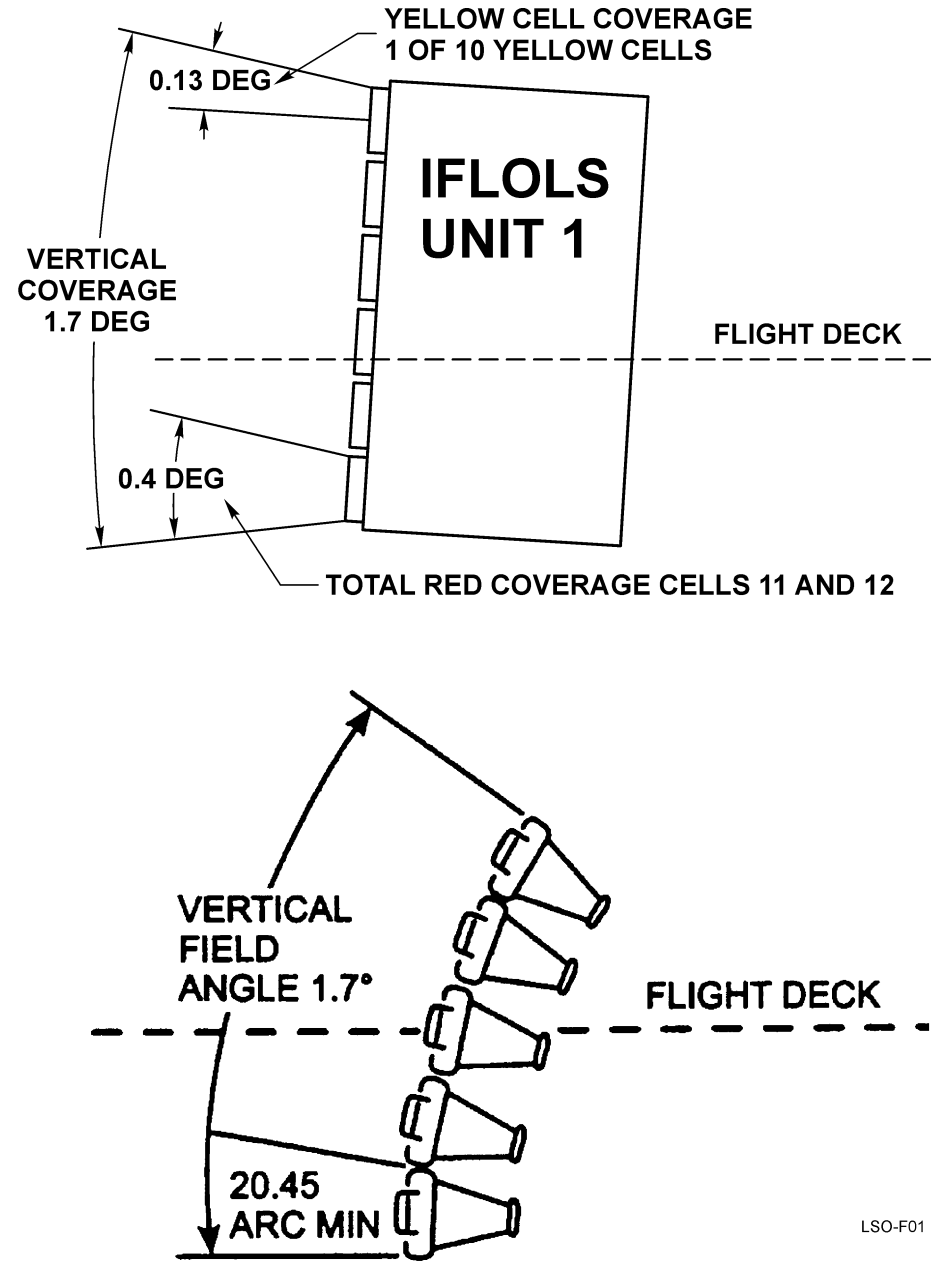

Figure 3-1. FLOLS Vertical Field Angle

Figure 3-2 helps illustrate vertical field angle and also shows why pilot glideslope corrections must become smaller as the aircraft approaches the touchdown point.

Couple the conditions of Figure 3-2 with too bright a lens setting (which significantly reduces ball definition the closer the aircraft approaches the lens) or minor visual acuity problems (pilot, weather, salt on lens, etc.), and the result is unperceived glideslope deviations.

The lenticular lens is the vertical fluted lens attached in front of the Fresnel lens. It provides meatball color and azimuth (±20°) and helps to disburse sun reflection from the lens face. The slots should be outside. It can be easily *Murphyed* (i.e., slots on the inside). Since it is exposed to the elements, it needs to be kept clean and dry. Salt, water, dirt, or exhaust smoke may cause spherical aberration (i.e., poor definition). These lenses are plastic and will be damaged and need immediate replacement if they are cleaned improperly.

3.3.2.2 Circuitry

Source lights are wired in series-parallel in all cells. Each cell contains three lamps. If one lamp fails, the corresponding lamp in the other four cells will go out. This provides constant, even illumination from cell to cell. When one lamp burns out, a failure light illuminates on the MK 8. When one lamp in a string fails, extinguishing the entire string, the source lamp intensity must be increased to compensate for the loss of one lamp in each cell. This increased voltage on the remaining lamps will age them faster. The source light series/parallel circuitry provides for all lamps to age at the same rate, thus (theoretically) producing even illumination among the cells.

3.3.2.3 General Operating Intensities

Set the source, low cell, and datum lights to minimum intensity prior to energizing the lens, then adjust the intensity after the lens is on. Maximum recommended intensity settings during daylight are near 9.0, and are usually required at low sun angles. Night settings normally range from 2.0 to 3.0.

3.3.3 MK 14 Improved Fresnel Lens Optical Landing System (IFLOLS)

The IFLOLS Mk 14 MOD 0 is a visual landing aid that displays glide path and trend information to a fixed wing pilot approaching the runway. The system presents a display that is useable at a range of 1.0 nautical mile. The MK 14 visual displays for the pilot are identical to the shipboard MK 13 IFLOLS. Refer to the MK 13 shipboard IFLOLS discussion (Chapter 4) for further information.

3.3.3.1 MK 8/ MK 14 Differences

The MK 14 IFLOLS does not have roll angle adjustment like the MK 8 MOD 0, the MK 14 is fixed in roll as is the MK 8 MOD 1. This results in different touchdown points for aircraft of different hook-to-eyes. The MK14 IFLOLS has a separate intensity control for the two low cells (red). Additionally the MK 14 low cells (red) can be flashed at 45 flashes per minute like the MK 13 Shipboard IFLOLS. The MK 14 is a taller display, a six foot tall source box verses a four foot tall source box for the MK 8. This results in the MK 14 being 50-percent more sensitive than the MK 8. MK 8 pilots using the MK 14 IFLOLS, for the first time, may over control the approach. Pilots familiar with the MK 14 but making an approach to the MK 8 might not respond quickly enough to indicated glideslope deviations. The taller MK 14 display results in the system being physically higher than the MK 8 and the MK 14 may have to be removed or relocated from the runway for widebody operations.

3.3.3.2 Moving the MK 14

The MK 14 is larger and heavier than the MK 8 but is easier to move because it is a four wheel trailer. The MK 14 has five jacks on it. The jacks must be raised and rotated parallel to the ground prior to moving the trailer. The MK 14 has surge brakes on it. The tongue of the trailer has the hydraulic reservoir and piston on it. If the tongue is compressed the brakes are activated. To back up the MK 14 trailer with a truck disconnect the quick release hydraulic fitting mounted on the tongue to keep the brakes fromactivating. See Figures 3-3 and 3-4.

DISTANCE FROM TOUCHDOWN	VERTICAL BEAM HEIGHT OF ALL 5 FLOLS CELLS (FT)	VERTICAL BEAM HEIGHT OF A SINGLE FLOLS CELL (FT)	VERTICAL BEAM HEIGHT OF ALL 12 IFLOLS CELLS (FT)	VERTICAL BEAM HEIGHT OF AN IFLOLS YELLOW SOURCE CELL (FT) 1 of 10	VERTICAL BEAM HEIGHT OF AN IFLOLS RED LOW CELL (FT) 1 of 2
TOUCHDOWN	11.8	2.4	13.6	1.1	1.4
RAMP (230 FT)	18.6	3.7	20.4	1.6	2.2
1/4 nm	56.8	11.3	58.6	4.5	6.7
1/2 nm	101.8	20.4	103.6	8.0	12.0
3/4 nm	146.9	29.4	148.7	11.4	17.3
1 nm	192.1	38.4	193.9	14.9	22.6
2 nm	372.5	74.5	374.3	28.7	43.8

Figure 3-2. FLOLS Vertical Field Angle Table

3.3.3.3 MK 14 System Set-up

The MK 14 has precision bubble levels installed on it for easier set-up. These bubble levels are mounted on the back of the source light box (Unit 1) and located just above jack 3, see Figure 3-4. One bubble is for roll and two for pitch. There is a 3.0° pitch bubble and a 3.25° pitch bubble. Typically the IFLOLS sites have concrete pads, which the MK 14 sits on, and the five jack locations are marked on the pad. The MK 14 is moved onto the pad and jacks 1, 2 and 3 are used to level the trailer in pitch and roll. Each site has specific jack heights that are used for preliminary leveling. Final leveling is then accomplished using the bubble levels. Jacks 4 and 5 are then lowered to help stabilize the trailer. Final verification is accomplished with a pole check using a mirrored pole.

3.3.4 MOVLAS

The Mk 2 Mod 2 land-based MOVLAS is compatible with the Mk 8 FLOLS, or may be used independently. Refer to the shipboard MOVLAS discussion in Chapter 4 for further information concerning the MOVLAS system.

3.3.5 Operation and Checks of Shore-Based Visual Landing Aids

The following discussion provides pertinent information regarding the operation and preoperational checks for shore-based visual landing aids.

3.3.5.1 Pole Check

All land-based optical systems are checked for basic angle at a point 150 feet in front of the unit using a telescoping mirror. The exact height of the mirror assembly shall be calculated using site survey data as described in the applicable system operational manual.

3.3.5.2 Intensities

When setting intensities of the lens, excessive intensity of the lights causes light spillage, interference with pilot's vision, reflection of light into the background, and an afterglow. The reflection of light into the background hampers proper identification of the meatball by the pilot on approach and may cause mistaken identification of light reflection for a nonexistent meatball. The afterglow may impede the pilot's vision in the final stages of approach, prevent him from recognizing a waveoff, and cause the loss of the glidepath. Light brightness settings must always be maintained near the minimum required intensity to compensate for ambient light and weather conditions. The brightness settings are determined by the position of the lens with respect to the sun and by the decision of the LSO.

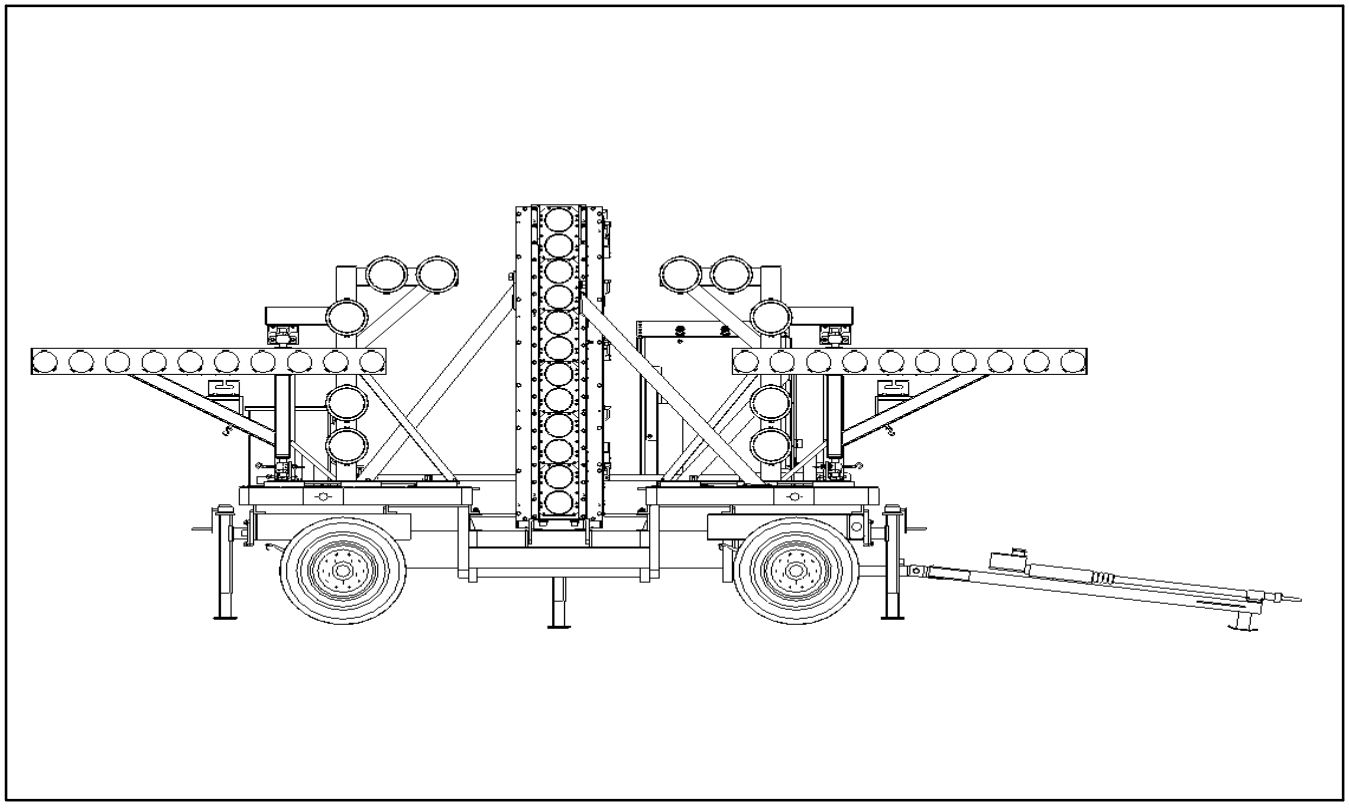

Figure 3-3. Moving the MK 14

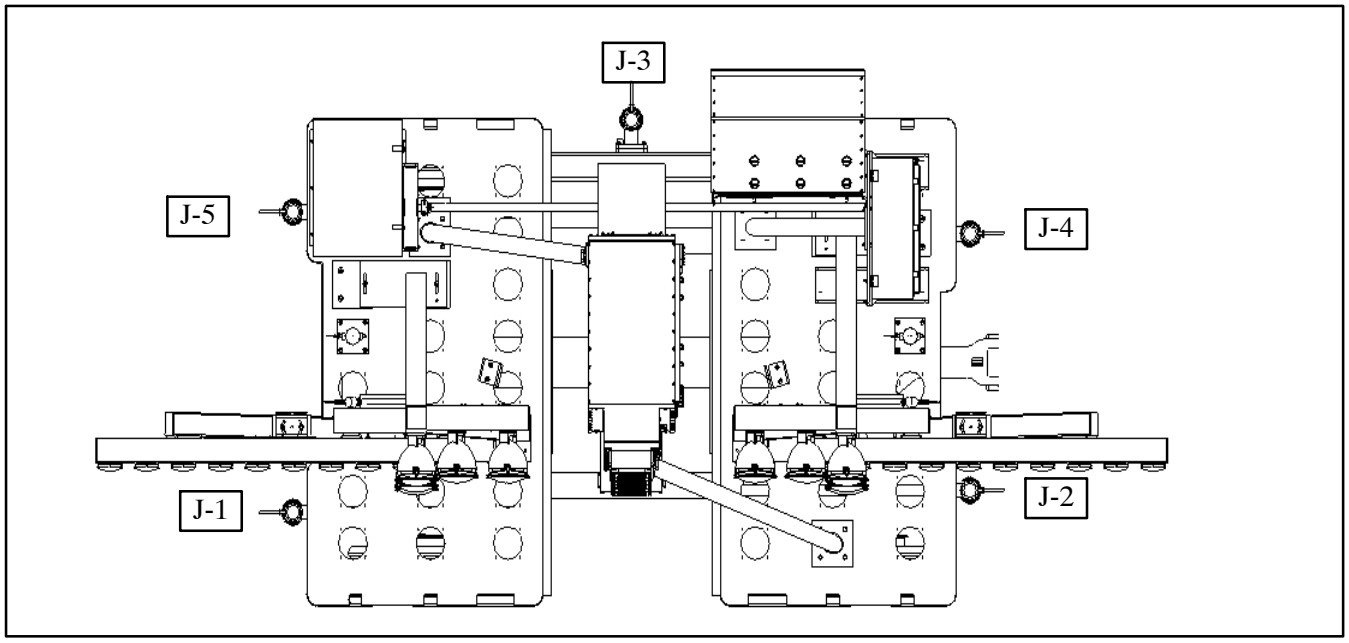

Figure 3-4. MK 14 System Set-up

3.3.5.3 Touchdown Points

The height of the datum lights above the runway surface is different for each of the shore-based optical systems. This height difference results in slightly different approach geometry and aircraft touchdown point when using the various systems. Touchdown points also vary with each aircraft because of their differences in hook-to-eye (or main tires to eye). The Mk 8 Mod 0 with its roll angle drive assembly is the exception and maintains a constant hook touchdown point. Most field optical landing systems use only basic angles; no roll angle adjustments are made, and each aircraft will have a different touchdown point based on its H/E value.

Relative wind over the deck needs to be considered during FCLP to select a reasonable compromise on glideslope angle used, considering pilot senses, aircraft power response, LSO sight picture, and aircraft aerodynamics. When selecting a basic angle for FCLP with relatively light winds at the field, a 2-3/4° or 3° glideslope may have the pilot and the LSO seeing a low, flat glideslope. Additionally, the ball will be considerably more difficult to control as the aircraft approaches touchdown. This may become apparent in an excessive number of bolters or early touchdowns.

3.4 LSO GREENHOUSE AND RADIOS

Located at many master jet bases and their outlying fields are environmentally protected LSO stations.

The greenhouse should house the controls for the FCLP equipment listed in paragraph 3.2 (i.e., standard LSO pickle switch, MOVLAS controller, radio, etc.). Radio equipment configuration may vary, but must include as a minimum a UHF transceiver with guard transceiver capability.

3.5 LSO VEHICLE

A variety of vehicles are available for LSO use at facilities not having a permanent LSO workstation (greenhouse). Although several radio configurations are available, a minimum of one UHF transceiver (with guard capability) and VHF or FM transceiver (for LSO to tower communication) is required for FCLP operations.

CHAPTER 4

Shipboard Workstation

4.1 MINIMUM EQUIPMENT LIST FOR SHIPBOARD OPERATIONS

4.1.1 Day Carrier

The minimum equipment required for day carrier operations includes the following:

1. Visual landing aid and necessary accessories, including three portable switch assemblies (waveoff pickles) with a press-on and release-off cut switch.
2. MOVLAS.
3. The following operable communication equipment is required on the LSO platform:
   a. Minimum of 2 Air-to-Ship radio communication devices, one for Backup LSO and Controlling LSO, with connections for 2 headsets/handsets each. At a minimum, the communication devices shall provide access to CATCC Final A and Final B UHF radio circuit transceivers and 2 dedicated/backup Air-to-Ship UHF transceivers. The dedicated/backup transceivers shall be capable of selecting required frequency channels from the Backup/Controlling LSO operating area.
   b. The communication devices shall provide the capability for the Backup and Controlling LSO to override/preempt any Air-to-Ship radio transmission on the frequency of the landing aircraft. In addition, the Backup LSO communication device shall provide the added capability to override/preempt the Controlling LSO.
   c. Access to the Ship's Service Telephone System (SSTS) for administrative calls.
   d. Internal Communications (IC) access to Primary Flight Control, CATCC, Arresting Gear operators and PLAT/Lens operators.
   e. Direct communication access to the Air Officer.
   f. A sound-powered hot line to the air officer.
4. For ACLS capable ships, during Case III operations, operable LSO HUD SPN-42/46 indicators.
5. Accurately calibrated relative wind indicator.
6. Colored deck status light system with intensity control for day and night use, clearly visible to PriFly and the LSO. Colored flags or paddles for use in the event of a deck status light failure.
7. 7 X 50 binoculars.
8. Distress equipment:
   a. Battery powered marker
   b. Life preserver ring
   c. Search and rescue sonobuoy.

9. Padded safety net, with an access to the catwalk and interior of the ship, continually maintained.

Note

The padded safety net is for emergency use only.

10. A windscreen, constructed of suitable material, with adequate window area.
11. An operable hook-to-ramp indicator and an operable hook touchdown point indicator.
12. A weatherproof, external radio speaker with adjustable volume control.
13. An operable PLAT/ILARTS monitor with centerline reference.
14. A current copy of all applicable ARB bulletins, as listed in ALB/ARB 0-11.

4.1.2 Night Carrier

All equipment required for day carrier operations is required at night, with the following additions:

1. Aldis lamp or high intensity spotlight which is located at the LSO platform for emergency use
2. Colored wands for use in the event of a deck status light failure.

4.1.3 Miscellaneous LSO Equipment Malfunction

The LSO shall notify the Air Officer of the malfunction or loss of any required equipment. The decision to continue recovery operations with any required LSO equipment inoperative shall rest with the commanding officer.

4.2 IMPROVED FRESNEL LENS OPTICAL LANDING SYSTEM (IFLOLS)

The IFLOLS Mk 13 MOD 0 is a visual landing aid that displays glide path and trend information to a fixed wing pilot approaching the flight deck. The system presents a display that is visible at a range of 1.0 nautical mile. The system displays a virtual image (ball) that is dynamically stabilized to compensate for ship's pitch, roll and heave motion. The ball appears aligned between two horizontal datum arms when the pilot is approaching on the optimum glide path. As the aircraft transitions about the optimum glide path, the ball will appear to be above or below the datum arm lights if the pilot is approaching high or low relative to the optimum glide path.

The IFLOLS includes a deck edge assembly (the lens); the IFLOLS lens room, the Pri-Fly area, and LSO platform.

There is a vast amount of printed information available on the IFLOLS. A thorough understanding of the following list of publications is a must for an LSO:

1. Technical Manual, Improved Fresnel Lens Optical Landing System Mk 13 Mod 0, Installation, Service, Operation, and Maintenance Instruction (NAVAIR 51-40ABA-21)
2. Aircraft Recovery Bulleting No. 63-12 (Mk 13 Mod 0 IFLOLS)

4.2.1 Optical Characteristics

4.2.1.1 Focal Point and Field of View

The inherent characteristics of the IFLOLS display is a linear projected glideslope (i.e., the total beam height becomes wider as distance from the lens is increased, and that width is linear). The further a pilot is from the lens, the more difficult it is for the pilot to perceive changes in glideslope. The total glideslope vertical coverage composed of 12 cells is approximately 1.7°. There are 10 source cells (0.13° each) and 2 low cells (0.20° each). Figure 4-1.

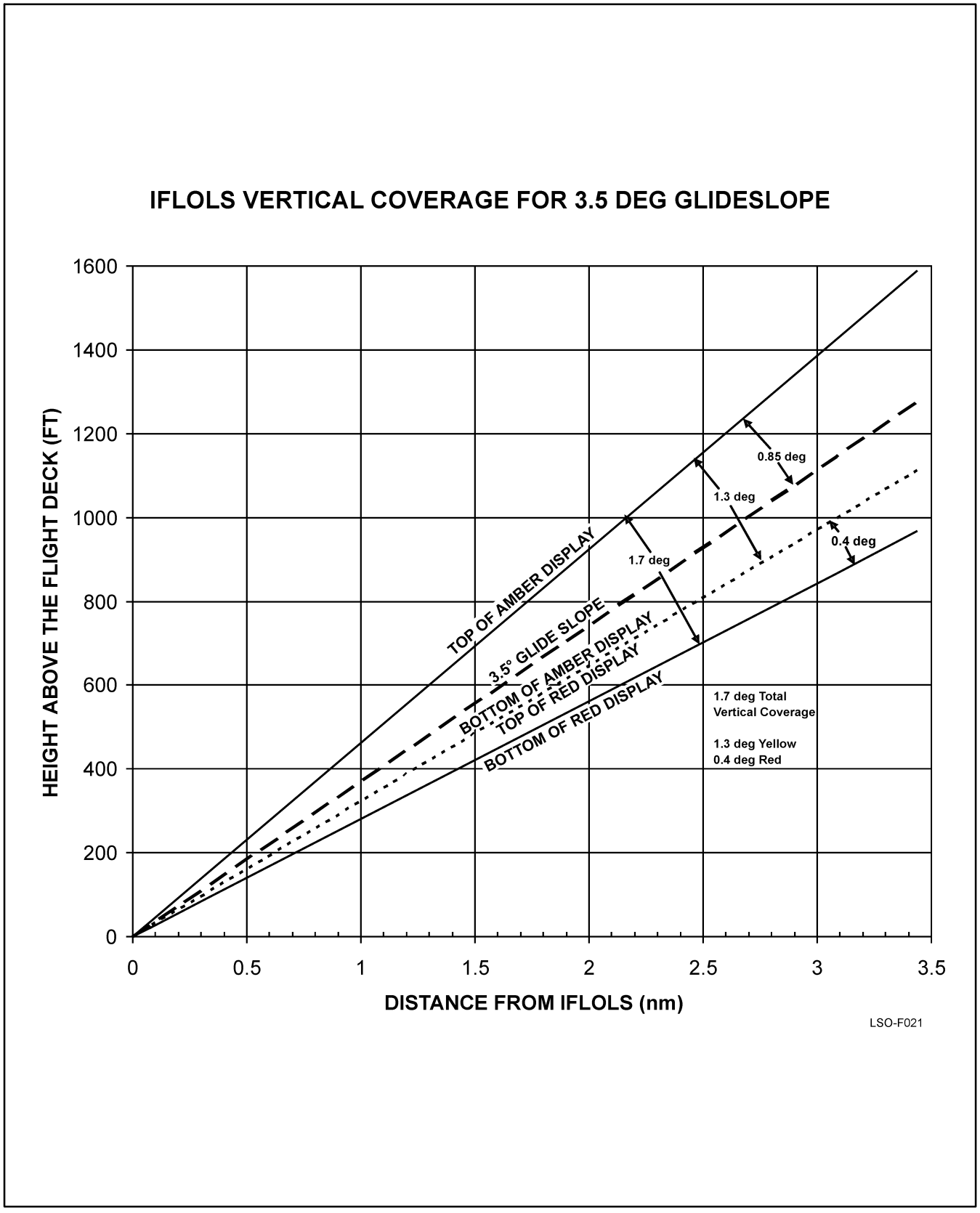

Figure 4-1. IFLOLS Vertical Coverage

Figure 4-2 helps illustrate vertical field angle and also shows why pilot glideslope corrections must become smaller as the aircraft approaches the touchdown point.

Couple the conditions of Figure 4-2 with too bright a lens setting which significantly reduces ball definition the closer the aircraft approaches the lens and the result is unperceived glideslope deviations. Also, minor visual acuity problems (pilot, weather, salt on lens, etc.) also can contribute to glideslope deviations.

Total azimuth coverage of ± 20° from centerline is provided (Figure 4-3).

4.2.1.2 Stabilized Optic Table

The Stabilized Optics Tables (SOTs) carry primary and backup source lamps, a lamp change mechanism, a fiber optic block, and a lamp changer/driver Printed Wiring Assembly (PWA).

4.2.2 General Operating Intensities

After boot up of IFLOLS the light intensities for the source, low cell and datum are set to zero. Adjust these settings along with the waveoff and cut prior to operations. Maximum recommended intensity settings during daylight are near 13.0, and are usually required at low sun angles. Night settings normally range near 5.0.

Intensity in the low (red) cell is adjusted independently. It may also be flashed at a 45 times-per-minute rate. The low cell flash touch “button” is located on the lighting screen on the flat panel display assembly in both the lens room and pri-fly locations.

4.2.3 System Condition Indicators

System condition messages are located on the flat panel display assemblies (in lens room, pri-fly and LSO control station). At the LSO station, messages are contained on the 4th and 5th lines of the Main screen, and in the system status bar on the lighting screen.

The LSO platform flat panel display assembly also contains a power-on and GO/NO GO system indicator.

DISTANCE FROM TOUCHDOWN	VERTICAL BEAM HEIGHT OF ALL 12 CELLS (FT)	VERTICAL BEAM HEIGHT OF A YELLOW SOURCE CELL (FT)	VERTICAL BEAM HEIGHT OF A RED LOW CELL (FT)
TOUCHDOWN	13.6	1.1	1.4
RAMP (230 FT)	20.4	1.6	2.2
1/4 nm	58.6	4.5	6.7
1/2 nm	103.6	8.0	12.0
3/4 nm	148.7	11.4	17.3
1 nm	193.9	14.9	22.6
2 nm	374.3	28.7	43.8

Figure 4-2. IFLOLS Vertical Field Angle Table

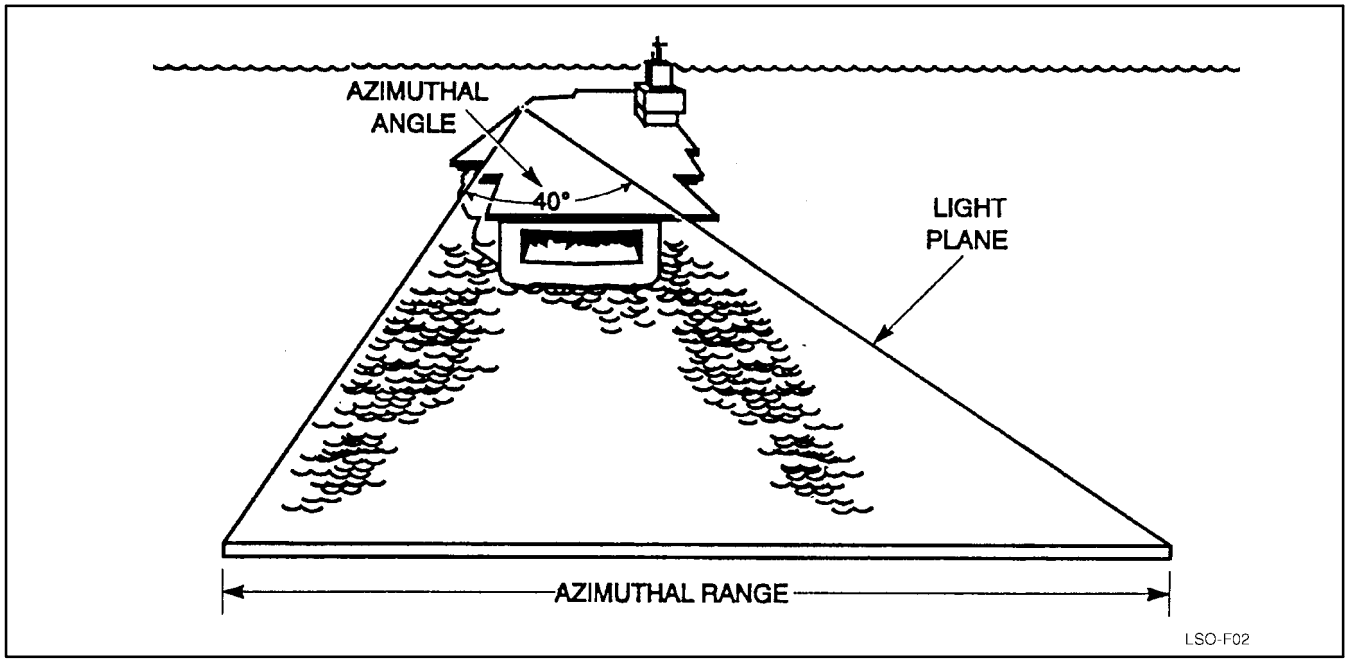

Figure 4-3. IFLOLS Azimuthal Range and Angle

4.2.4 Datum, Waveoff, and Cut Lights

Five fixed datum lights (green) and five conditional datum lights (green) are mounted horizontally on each side of the IFLOLS indicator display assembly (Unit 1). The fixed datums are continuously illuminated, while the conditional datums are extinguished when the waveoff lights are actuated. (Figure 4-11)

Three waveoff lights (red) and three emergency waveoff lights (red) are mounted vertically on each side of the IFLOLS indicator display assembly (Unit 1). When a waveoff is initiated, the waveoff lights first flash at full intensity, then dim to the preset brightness. The emergency waveoff lights are on a separate circuit and act as a backup system to the normal waveoff lights.

Four horizontal cut lights (green), two on each side, are located above the datum lights and alongside Unit 1. The cut lights are illuminated by means of a pushbutton on top of the LSO pickle switch, and also by a pushbutton on the LSO flat panel display assembly. The cut lights remain illuminated as long as the pushbutton is depressed; once released, the cut lights extinguish.

4.2.5 Stabilization Modes

The position of the SOT assemblies for any given ship's pitch, roll and heave is calculated from a series of stabilization equations in the stabilization software. The result is a stabilized glideslope with respect to the horizon under moving deck conditions. The following modes of IFLOLS stabilization are employed.

4.2.5.1 Inertial Mode Of Stabilization

The Primary mode of operation for the IFLOLS. This Mode is line stabilization with additional correction for ship's heave motion. It essentially stabilizes the glideslope regardless of carrier motion. The pilot must be on the centerline of the angle to see a properly stabilized display. During heavy sea states (5/6) in inertial mode, the hook to ramp clearance and touchdown point indicators will occasionally display a negative or aft touchdown point respectively. The dynamic touchdown point varies more in inertial mode than it does in line mode. This is the sacrifice for a more stable light beam/glideslope for the pilots. A pilot on a perfect pass may hit any of the four wires, the ramp or bolter, depending on ramp motion and heave. At the moment of touchdown, the hook touchdown point willbe displayed by the dynamic hook touchdown point indicator for a centered ball pass.

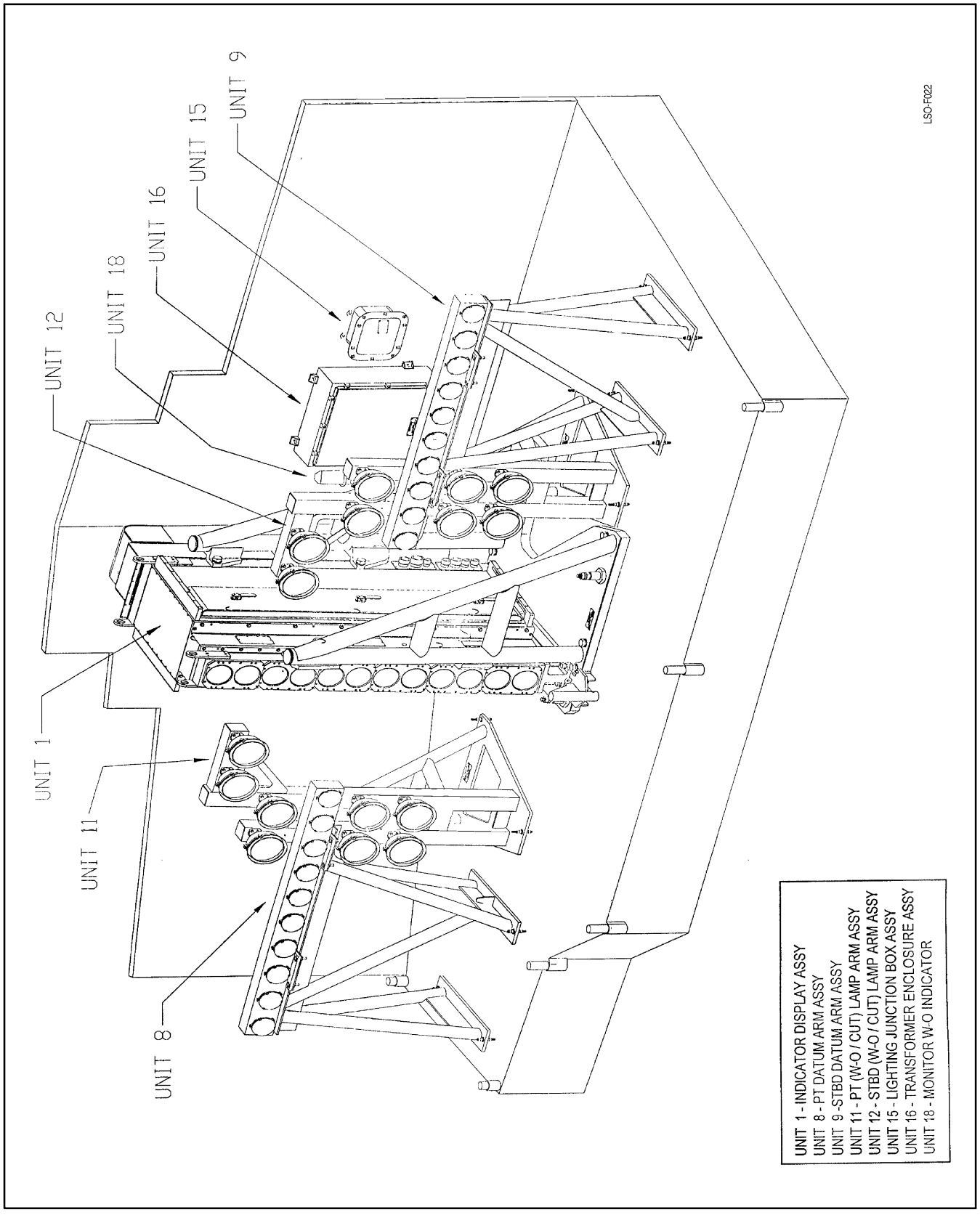

Figure 4-4. IFLOLS Deck Edge Equipment

4.2.5.2 Line Stabilization

Used as a backup to inertial mode, this mode stabilizes the IFLOLS display for pitch and roll motions of the ship maintaining a predetermined line in space at the intersection of the IFLOLS light plane and the true vertical plane through the centerline of the angled deck (Figure 4-5). This provides a completely stabilized glideslope referenced to the carrier deck, (glideslope moves with deck heave motion) as long as the pilot is on centerline of angled deck. Line mode is not stabilized for ship's heave(vertical displacement). Pilot perceived ball movement is because of ship's heave. Mode 1 should be flown using line stabilization mode, inertial is acceptable. IFLOLS Line mode should be used when aircraft are landing using ACLS Mode I. The aircraft chases the deck in Mode I approaches. For Mode I approaches IFLOLS Line mode provides a steadier ball to the pilot than inertial. With moderate and higher ship motion the pilot will still see some ball motion in the situation. Inertial mode should be used for ACLS Mode IA, II, III and all other approaches.

4.2.5.3 Stabilization Limits

Lens stabilization limits for the MK 13 MOD 0 are ±1.62° pitch, ±8.19° roll. It should be noted that in any discussion of deck motion and its associated effect on IFLOLS, rate of pitch is just as important as amount of pitch. A moderate amount of pitch, normally within the stabilization capability of the IFLOLS, can result in an unstabilized glideslope if the rate is rapid enough. The ballscrew assemblies simply cannot move to the required position quickly enough when the deck excursions are rapid.

4.2.6 Effects of Deck Motion

Using basic geometry, each 1-foot aircraft vertical deviation from optimum glideslope moves the hook touchdown point forward or aft in the landing area by the following distances:

Basic Glideslope Angle	Distance in Feet
3°	19.1
3.5°	16.4
3.75°	15.3
4°	14.3

4.2.7 Effective Glideslope Due to Wind and Deck Motion

The glideslope angle, referred to as the Basic Angle (BA) aboard ship, is the fixed pitch angle around which the lens assembly stabilizes. A BA setting of 3.5° is most commonly used, with 4° used for higher wind-over-deck conditions (38+ knots) or on the small decks when Hook-to-Ramp (H/R) clearance is near the 10-foot minimum. In moderate wind-over-deck conditions (32 to 37 knots), a 3.75° BA may be desirable. In Figure 4-6, note that decreased closure rate of aircraft to ship caused by wind-over-deck reduces the actual glideslope flown (effective glideslope).

WIND OVER DECK (KNOTS)	BASIC ANGLE (DEGREES)	EFFECTIVE GLIDESLOPE*
35	4	3.2
30	3.5	2.8
*Based on a 130-knot approach speed		

Aircraft landing stress limits are predicated on moderate deck conditions. Extreme deck motion may significantly increase these landing stresses; the ramp coming up at touchdown increases relative sink rate. Additionally, 1° of ramp down is the same as adding 1° to the glideslope as far as aircraft landing stresses are concerned. These deck motion factors are among the most critical to consider when landing aircraft on carriers.

During pitching deck conditions the aircraft hook may not engage the crossdeck pendant at the optimum angle. This may result in an apparent increase in the frequency of hook-skip bolters.

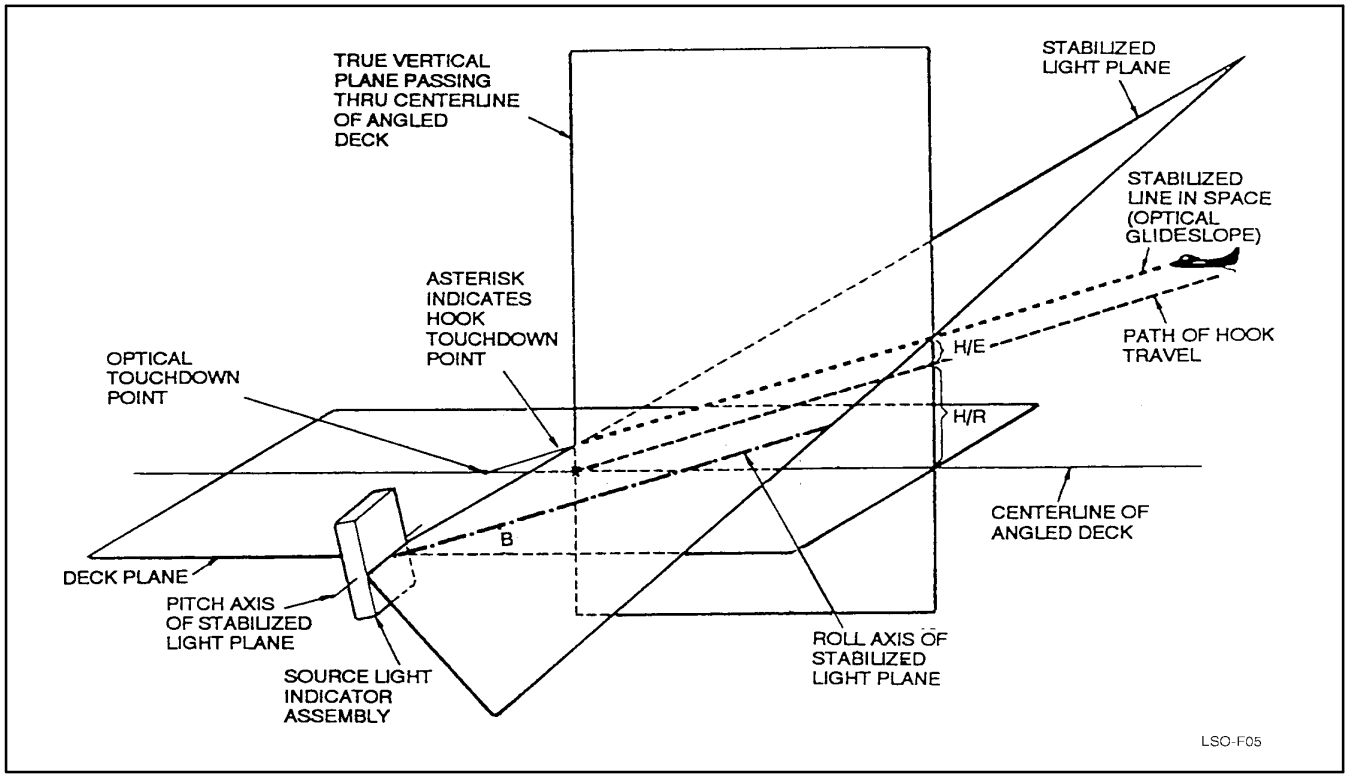

Figure 4-5. Geometry of Line Mode Stabilization

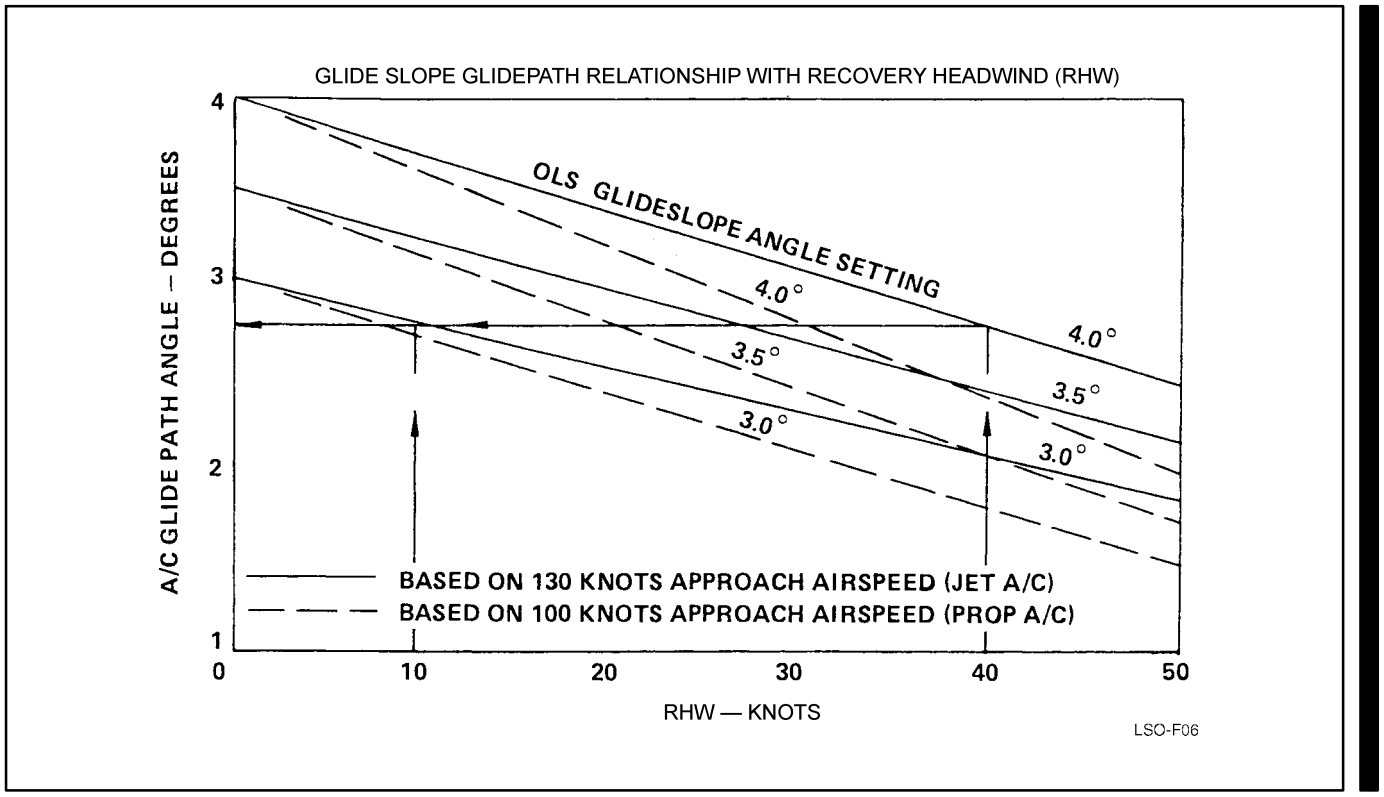

Figure 4-6. Glideslope Glidepath Relation With RHW

4.2.8 Roll Angle and Hook-to-Eye

IFLOLS Unit 1 has 12 light tables, one behind each lens (cell). These light tables are moved in unison to stabilize the source light plane for ship motion and to change the Basic Angle (BA) and set different aircraft Hook-to-Eye (H/E) values. To accomplish this the source light plane is rotated about two horizontal axes at right angles to each other, one axis called lens pitch and the second axis lens roll. While the IFLOLS Unit 1 does not have an actual pitch and roll axis, the source light plane rotates as if both axes were located within Unit 1. The lens pitch axis is perpendicular to the angle deck centerline and the lens roll axis is parallel to the angle deck centerline. The tilt in pitch, referred to as the basic angle, is seldom changed during a recovery. Typical basic angles are 3.5 or 4.0°. See Figures 4-7 and 4-8. Rolling (rotating) the source light plane, on the lens roll axis, causes the glideslope along the centerline of the landing area to be raised or lowered. This compensates for the various H/E distances to provide a constant hook path for all aircraft (Figure 4-9). H/E distance, which varies between aircraft types, is the vertical distance between the hook path and the pilot's eye path relative to the carrier (see Figure 4-10). Aircraft Recovery Bulletin No. 62-12 provides H/E values for all aircraft and aircraft configurations. These H/E values, along with BA, desired hook touchdown point (HTDP), and ship's static pitch/roll miss trim, are used by IFLOLS to calculate and set the proper static lens roll angle. The static roll angle range of IFLOLS is approximately ±8°. Static roll changes do not account for stabilization of the source light plane for ships motion. A 0° roll angle is a source light plane that is level in roll. Increasing the roll angle raises the source light plane along the angle deck centerline. The roll angle is increased when changing from an aircraft with a small H/E to an aircraft with a larger H/E. Positive roll angles are roll angles that raise the source light plane above level over the angle deck centerline. For IFLOLS on 68 class carriers a H/E of approximately 16.5 feet with a 3.5° BA and 230 ft HTDP results in a source light plane level in roll (zero roll angle). The static roll angles of current fleet aircraft (April 2007) vary approximately ±1.5° except for the T-45 which has an approximate –3° roll angle. For the CVN-76/77, 3 wires HTDP 212 ft, the nominal roll angles are all approximately 0.75° more negative with respect to 4 wire 230 ft HTDP ships. The CVN-78 will be approximately 1.5° more negative. The selected BA will not change when the lens roll angle is increased or decreased.

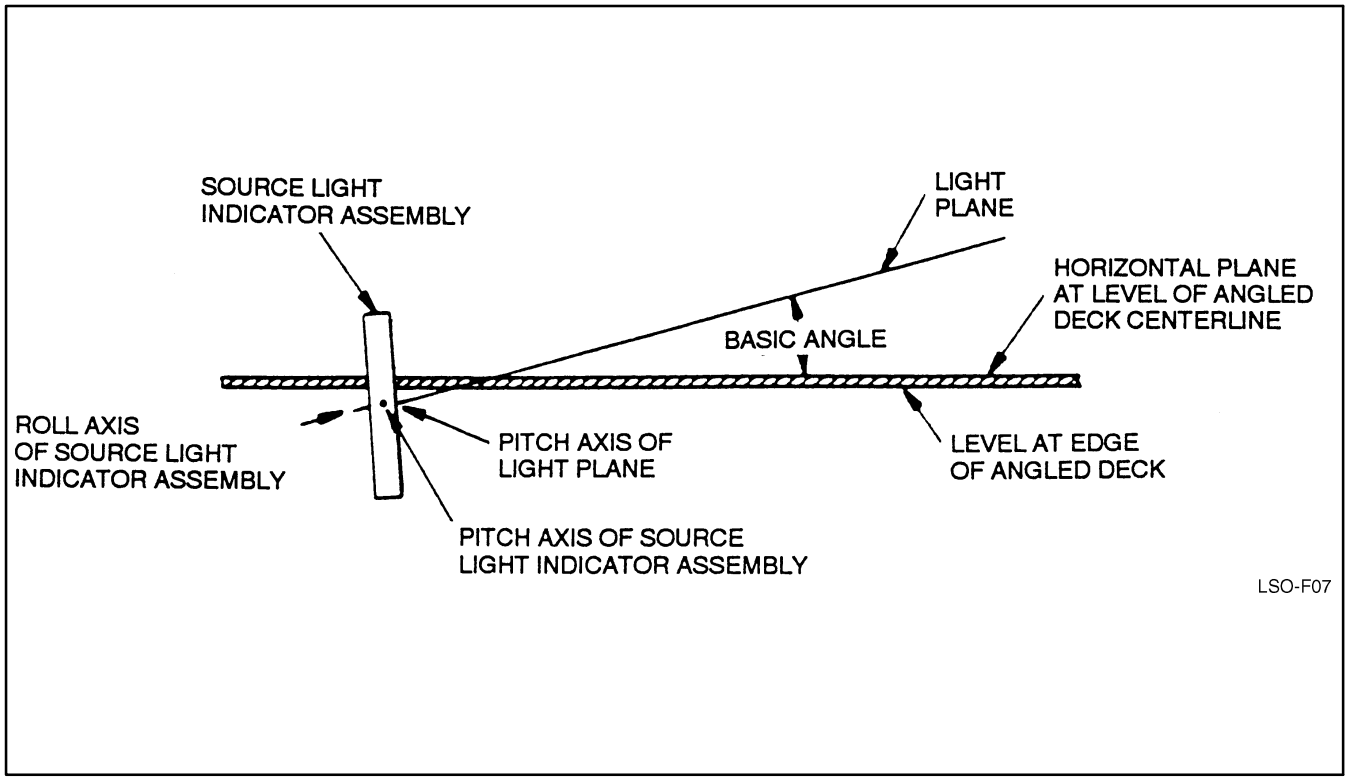

Figure 4-7. Determination of Basic Angle

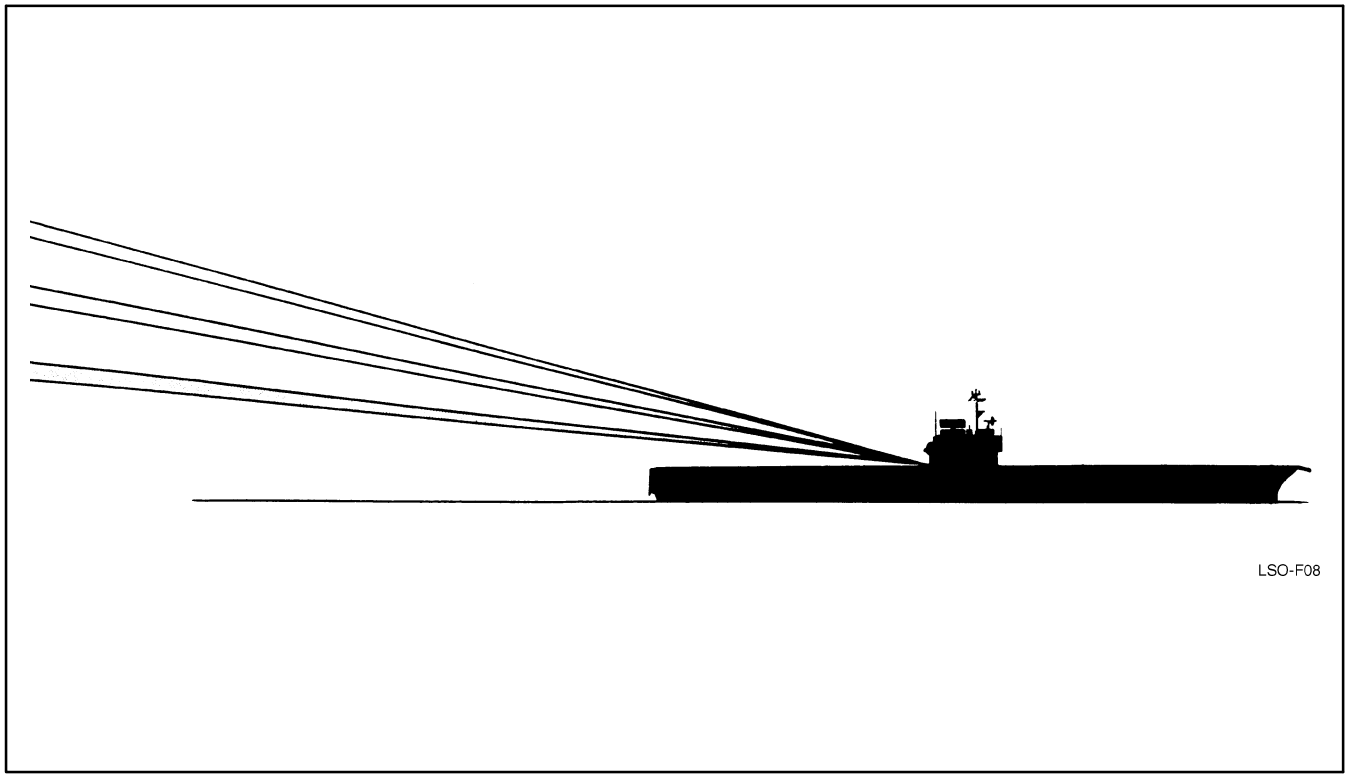

Figure 4-8. Effects of Pitch Angle (Basic Angle) Changes on Light Plane

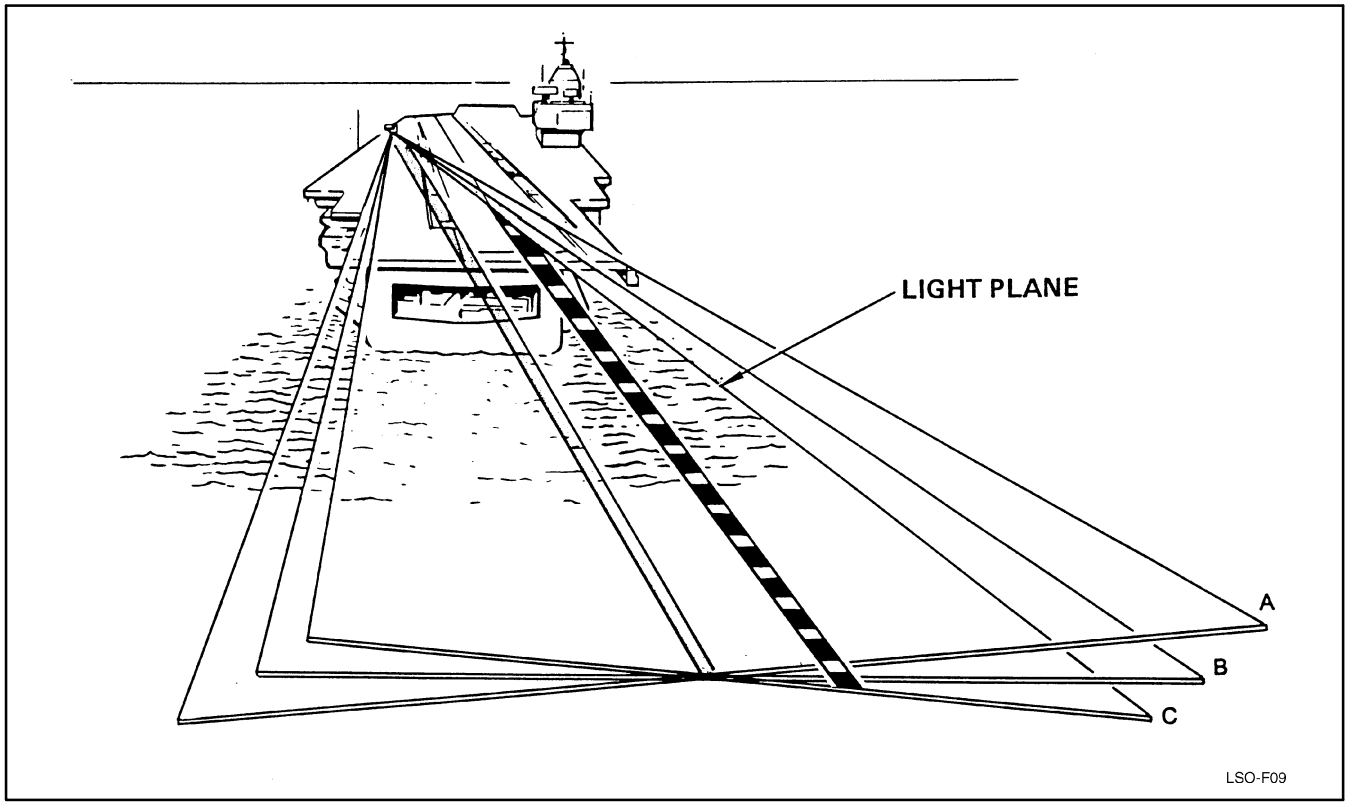

Figure 4-9. Effects of Hook-to-Eye Changes on Light Plane

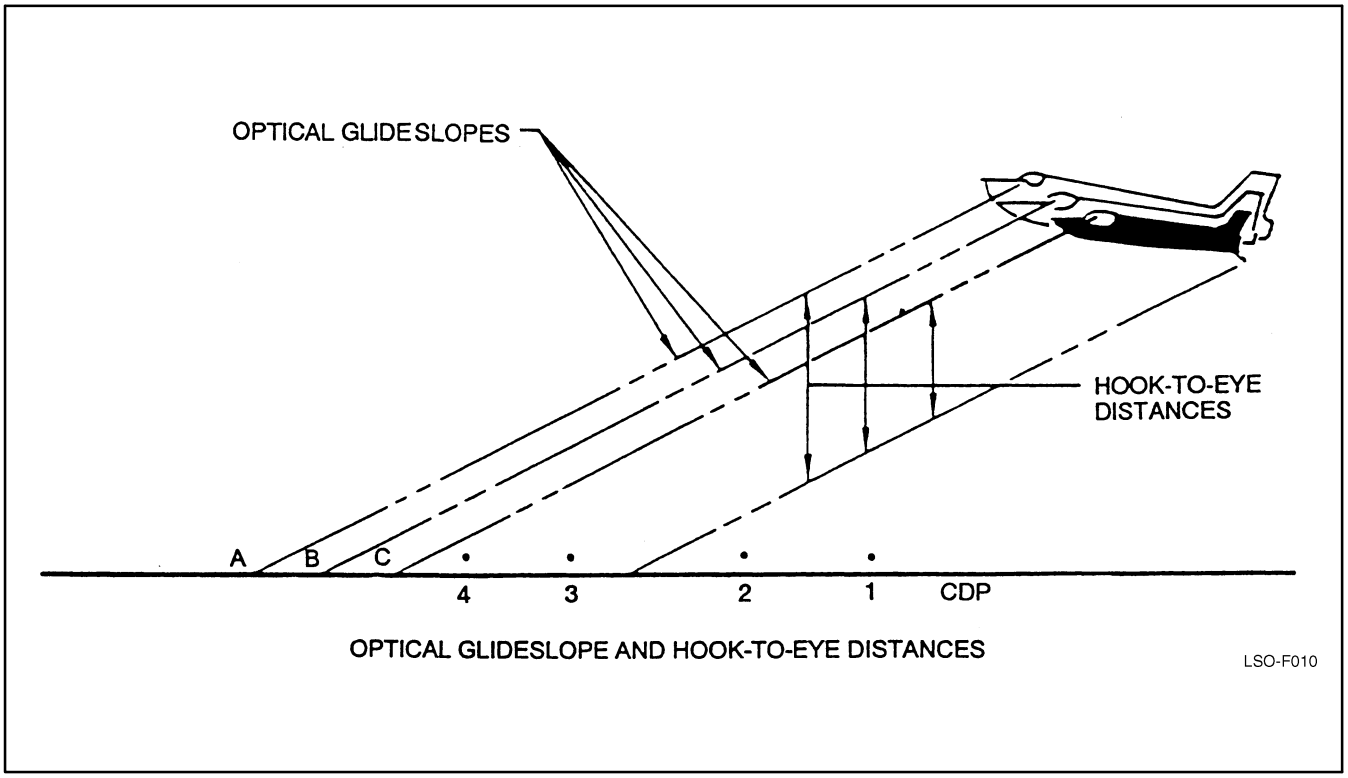

Figure 4-10. Optical Glideslope and Hook-to-Eye Distances

CAUTION

Because of roll angle pilots observing a center ball, but flying an extreme off-center approach, may have hazardous hook to ramp clearance.

No roll angle or BA settings are used for MOVLAS as the LSO manually controls the ball to establish the proper glideslope. Most field optical landing systems change only basic angle (3.0 or 3.25°); no roll angle adjustments are made, and each aircraft type will have a different touchdown point based on its H/E value.

All published lens settings are intended to provide optimum hook glidepath, with a hook touchdown point halfway between the number two and three crossdeck pendants (4 wire ships). Roll angle places the visual glideslope some distance above the hook glideslope that corresponds to each aircraft's H/E distance. H/E (in feet) is determined for each aircraft while properly configured; flying on speed, optimum attitude, and with a centered ball. For many aircraft, a change in configuration will change H/E distance. H/E values for various configurations are specified in the Recovery Bulletins. If no preconfigured H/E pushbutton is available for the aircraft, IFLOLS has a Non-Standard H/E adjustment to provide the desired glidepath and hook touchdown point.

Failure to maintain optimum aircraft attitude to touchdown may result in engagement of other than the targeted wire even with the aircraft on the visual glideslope (i.e., pilot sees a centered ball) at touchdown. Additionally, pilots flying an optimum aircraft attitude and on a centered ball may also engage other than the targeted wire if there is appreciable ship motion.

Deck centerline camber (i.e., the centerline is higher than the deck edge) is for water drainage. On most decks it is approximately 4 inches. All lens settings in the Recovery Bulletins compensate for deck camber.

4.3 IFLOLS STABLIZATION INPUTS

IFLOLS receives ship's pitch and roll information from either the ship's gyros or SPN-46. IFLOLS receives ship's heave information from either an IFLOLS generated ship's heave signal or SPN-46. The IFLOLS signal is generated using the IFLOLS unit 5 accelerometer. The IFLOLS can use either ship's pitch and roll gyro source with either heave source. When aircraft are landing using ACLS, any mode, IFLOLS should use the same stabilization inputs as SPN-46. Typically SPN-46, SPN-41, and IFLOLS will all use the SPN-46 gyro for pitch, roll, and heave information when aircraft are landing using ACLS.

4.4 MANUALLY OPERATED VISUAL LANDING AID SYSTEM (MOVLAS)

The Mk 1 Mod 2 MOVLAS is a backup shipboard visual landing aid system that is used when the primary optical system (IFLOLS) is inoperable, when stabilization limits are exceeded, or for pilot/LSO training. The system presents glideslope information in the same visual form presented by the IFLOLS system. There are three installation stations aboard ship (Figure 4-11):

WARNING

The range/rate of MOVLAS MK1 Mod2 indications does not accurately represent that of the IFLOLS and may affect the pilot's perception of glideslope.

STATION 1: Installation is immediately in front of the IFLOLS and utilizes the IFLOLS waveoff, datum, and cut light displays.

STATION 2: Installation is completely independent of the IFLOLS. Because of cable resistance, it must be located on the port side not less than 75 feet nor more than 100 feet aft of the IFLOLS assembly.

STATION 3: Installation is mounted on a base assembly located on the flight deck on the starboard side. The approximate position is aft of the island and outboard of the safe parking line. The exact location can be determined by the air officer, LSO, or other cognizant personnel (i.e., CAFSUs). Utilization of this position may require on-deck aircraft movement.

4.4.1 MOVLAS Construction

The light box contains 23 vertically mounted lights that provide the meatball display. A set of perforated doors may be latched open or closed in front of the unit. When closed, the light intensity is decreased to approximately 3.5 percent of that with the shutters open. This doubles the range of light intensity control available from the power controller box and ensures adequate intensity range for day and night use. The bottom six lamps are red to provide coloring similar to the IFLOLS low cell (they do not flash). Two toggle switches mounted on the LSO controller disable the lower and uppermost three lamps. With either switch in the disabled position, the controlling LSO can indicate to the pilot a glideslope position beyond the limits of the normal IFLOLS system (i.e., ball off the top/bottom of the lens).

Note

Air wing policy should determine the position of the upper lamp enable switch. The lower lamp enable switch shall remain in the Enabled On position at all times.

For MOVLAS stations 2 and 3, a datum box unit is mounted on each side of the light box and contains five separate datum lamps, four waveoff lamps, and one cut lamp. The single perforated door is used to increase the range of intensity control for the waveoff and cut lights. Perforated doors are used for all lamps which are not continuously lighted to ensure sufficient line voltage across the filaments to light the lamp instantly.

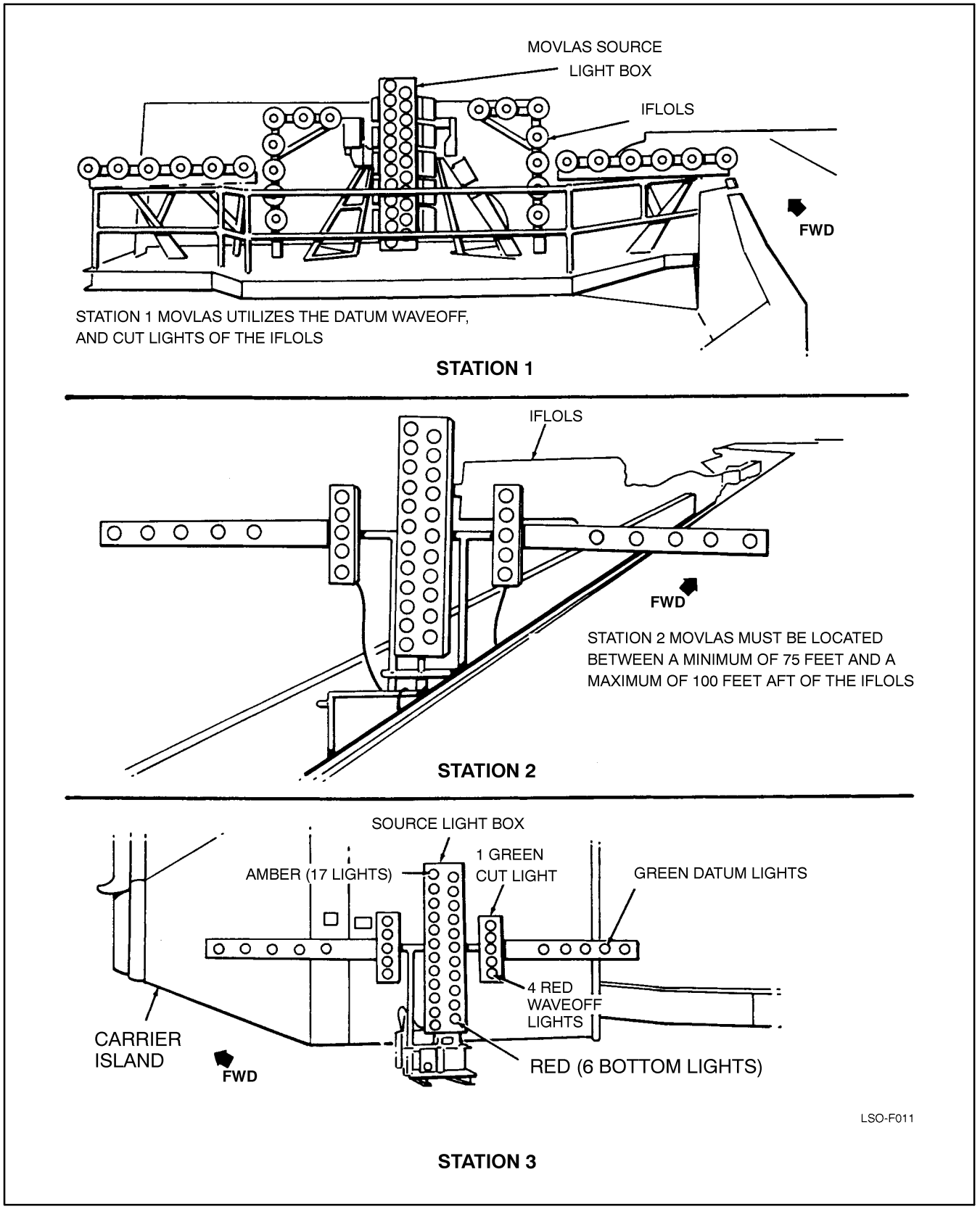

Figure 4-11. Manually Operated Visual Landing Aid System (MOVLAS) Mk 1 Mod 2 Shipboard, General Arrangement

The LSO controller is located at the LSO workstation. A handle on the controller enables the LSO to select the position of the meatball. The pickle switch is attached to the end of the controller handle. As the handle on the LSO controller is moved up or down, it lights three or four consecutive lamps in the light box, thus providing an LSO controlled meatball. Detents are located at the horizontal or centered ball position and near the bottom just prior to the red ball going off the bottom.

Independent controls are provided for intensity adjustment of the datum and source lights, with a combined control for the cut and waveoff lights. When activated, waveoff lights flash at a rate of 90 times a minute.

Because the controller detents proved inadequate in use, MOVLAS Service Change No. 13 added a repeater light box to the system. The repeater monitors every other light on the light box and allows the LSO to visually monitor the glideslope he is presenting to the pilot while facing the approaching aircraft (Service Change No. 13 also added the disable switch to the uppermost three lamps). A separate MOVLAS repeater is also integrated into the left side of the LSO HUD console. A small panel opens behind which there is a mirror that reflects the MOVLAS repeater image to the LSO.

Additional information about MOVLAS may be found in NAVAIR 51-40ACA-3 (Mk 2 Mod 2 landbased MOVLAS) or NAVAIR 5l-40ACA-2 (Mk 1 Mod 2 shipboard MOVLAS).

4.5 LSO HEADS-UP DISPLAY

The Mk 1 Mod 0 LSO HUD console system (Figure 4-12) provides the LSO with real time aircraft, deck motion, deck status, and trend information in a consolidated display. It provides the LSO a dynamic visual display of all critical aircraft landing factors including range, rate of descent, true or closing airspeed, and lineup and glideslope data as well as indicators of wind-over-deck relative to the landing area, clear/foul deck status, aircraft type, and approach mode. Ramp motion/ship's trim information is also available. A MOVLAS repeater, 21 MC intercom (not present if an IVN phone is located in the Base Console), a control switch to select between centerline video or ISIS racetrack, and two SATCC terminals for communications.

4.6 LSO BASE CONSOLE

The LSO Base Console (Figures 4-13 and 4-14), located to the right of the LSO HUD, consolidates several essential LSO equipment items. These includes: the IFLOLS LSO control panel assembly (Unit 4), ISIS control panel assembly (Unit 28F1040), radio set control panel (WSC-3 or SRC-27), deck status light control panel, 19MC intercom panel or IVN (Integrated Voice Network) phone, sound powered phone panel assembly, and a connector panel assembly with receptacles for sound powered phones, Aldis lamp, LSO handsets, and portable switch assemblies.

4.6.1 IFLOLS Panel Assembly

The LSO IFLOLS Panel Assembly (Figures 4-16 and 4-17) provides the LSO with two visual display screens; main and lighting. The two screens are modified versions of the system main and lighting found at the lens room and pri-fly.

4.6.1.1 IFLOLS LSO Main Screen

The LSO Main Screen (Figure 4-16) graphically represents a Hook-to-Ramp (H/R) meter and a Hook Touch Down (HTD) meter. Both meters display dynamic and static information. Additionally, a barricade indicator and targeted wire information are displayed. Across the screen in larger letters is displayed the aircraft (A/C) Type, Hook-to-Eye (H/E), Basic Angle (BA), "Failure" message and Waveoff indication. This screen also provides two lines of text, which are only displayed under certain conditions; line four will indicate a major system FAILURE, and the fifth line will indicate that WAVE OFF has been initiated.

4.6.1.2 IFLOLS LSO Lighting Screen

The Lighting Screen (Figure 4-17) has three areas providing information; the status bar, which has thirteen discrete data elements: A/C type, H/E distance, BA setting, which wire is optimal and its distance from the round down, system stabilization mode, system status, FAILURE MODE, where system failures will be indicated, Air Officer (A/O) interlock status, whether a H/R warning has been issued, status and frequency of the system low cell flash capability, whether waveoff has been initiated, whether CUT has been initiated, and whether the barricade is raised. The screen has graphical representation of intensity for: source light (ten top most cells), low cells (bottom most two cells), and datum/cut waveoff. This screen can be accessed only when the LSO selects one of these three intensity settings to view or change. The screen also provides a graphical representation of ship pitch (trim) and roll (list) in degrees. To change the intensity for the low cell or source lights select the appropriate button from the intensity control select block (the button should flash). Press the up and down arrows and the intensity setting should move one level each time the up or down arrows are press. The datum, cut, and waveoff button works by toggling through the three lighting intensities it controls and highlighting the one that is active at the top of the screen. To select the datum, cut, or waveoff lights press the datum, cut, and waveoff button until the lights are highlighted at the top of the screen and then select the up and down arrows to change the intensity. When the desired intensities are set the screen will timeout and return to the main screen.

1. HEADS-UP DISPLAY (HUD)
2. AIRSPEED INDICATOR, 1A2
3. RATE OF DESCENT INDICATOR, 1A7
4. ACLS INDICATOR ASSY, 1A6
   DISPLAYS:
   (a) WIND ANGLE
   (b) WIND SPEED
   (c) AUTOMATIC CARRIER LANDING SYSTEM (ACLS) STATUS
   (d) AIRCRAFT TYPE
5. INTERCOM (MODIFIED LS-458)
6. CONTROL PANEL ASSY, 1A17
7. CARRYING BAR
8. PAN-LOCK HANDLE
9. RANGE INDICATOR, 1A9
10. OBSTRUCTION LIGHT
11. RAMP MOTION INDICATOR, 1A10
12. INTEGRATED LAUNCH AND RECOVERY TELEVISION SURVEILLANCE (ILARTS) SYSTEM MONITOR
13. MOVLAS INDICATOR, 1A11
14. DECK STATUS AND FRESNEL LENS OPTICAL LANDING SYSTEM (FLOLS) WAVE-OFF INDICATOR, 1A3
15. POLARIZED FILTER
16. RED FILTER
17. NEUTRAL DENSITY FILTER
18. HEADWIND, CROSSWIND BRACKET
19. PICKLE SWITCH JUNCTION BOX

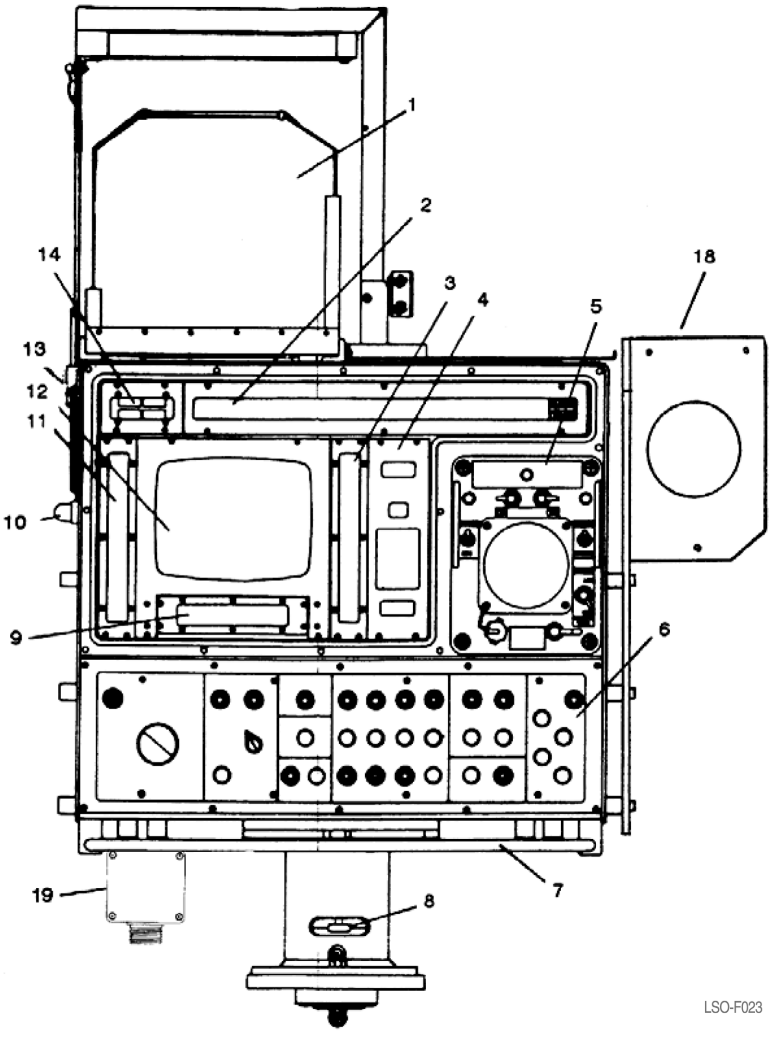

Figure 4-12. Mk 1 Mod 0 LSO Heads-Up Display (HUD) Console

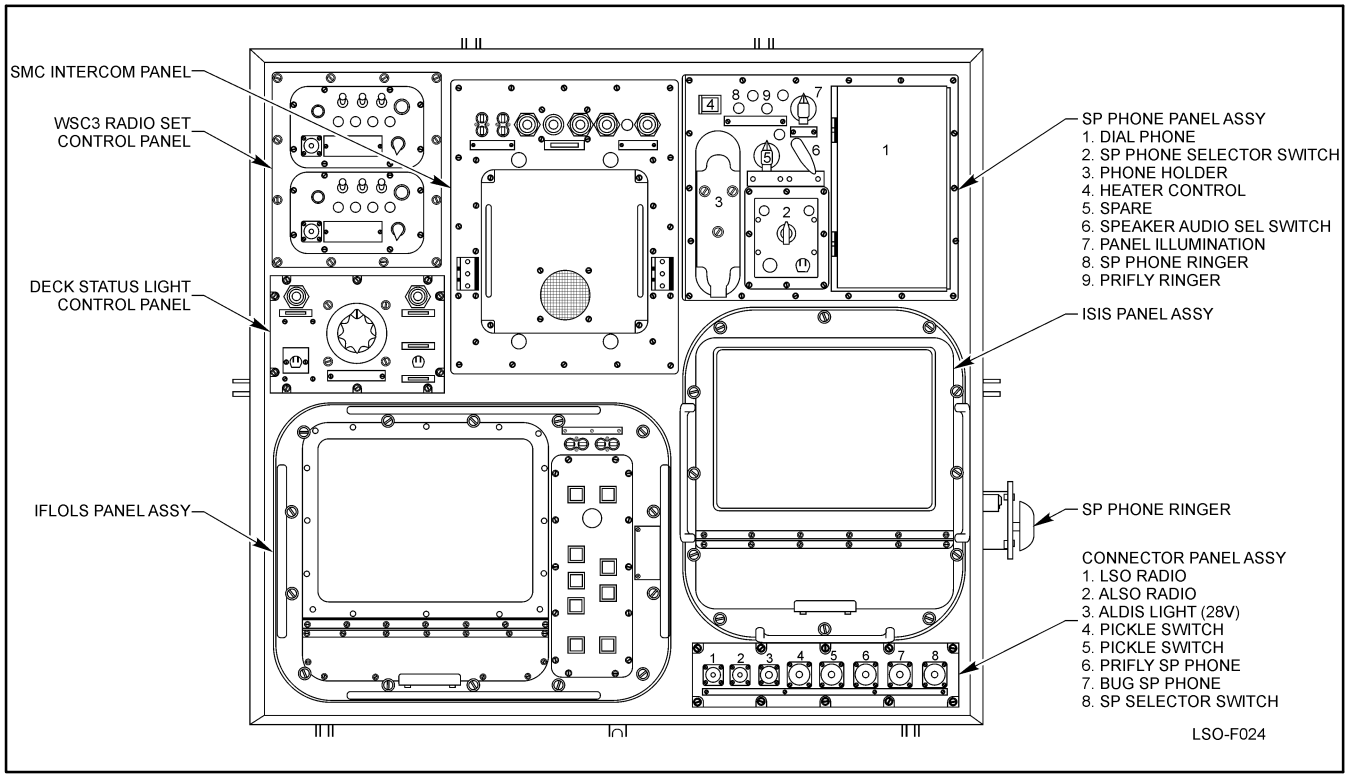

Figure 4-13. LSO Base Console

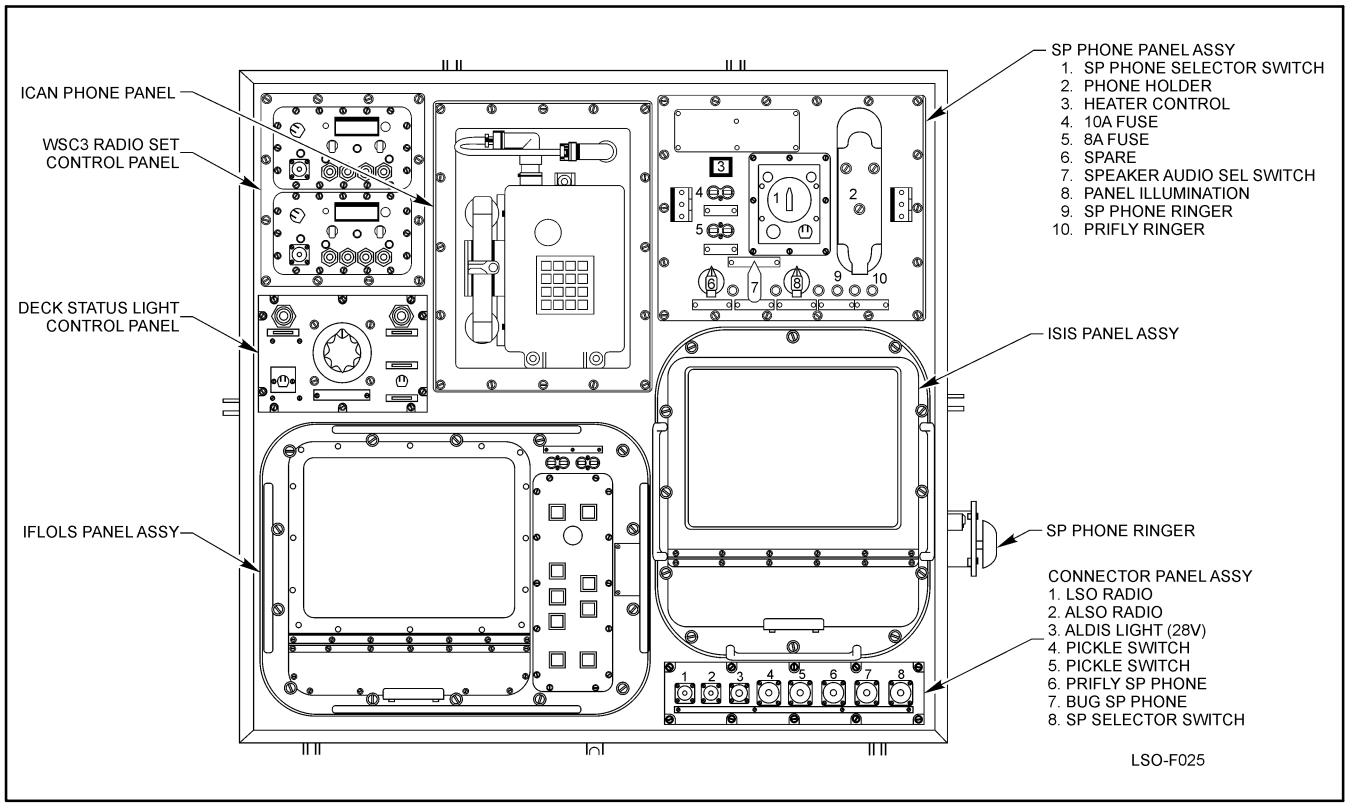

Figure 4-14. LSO Base Console With IVN Phone

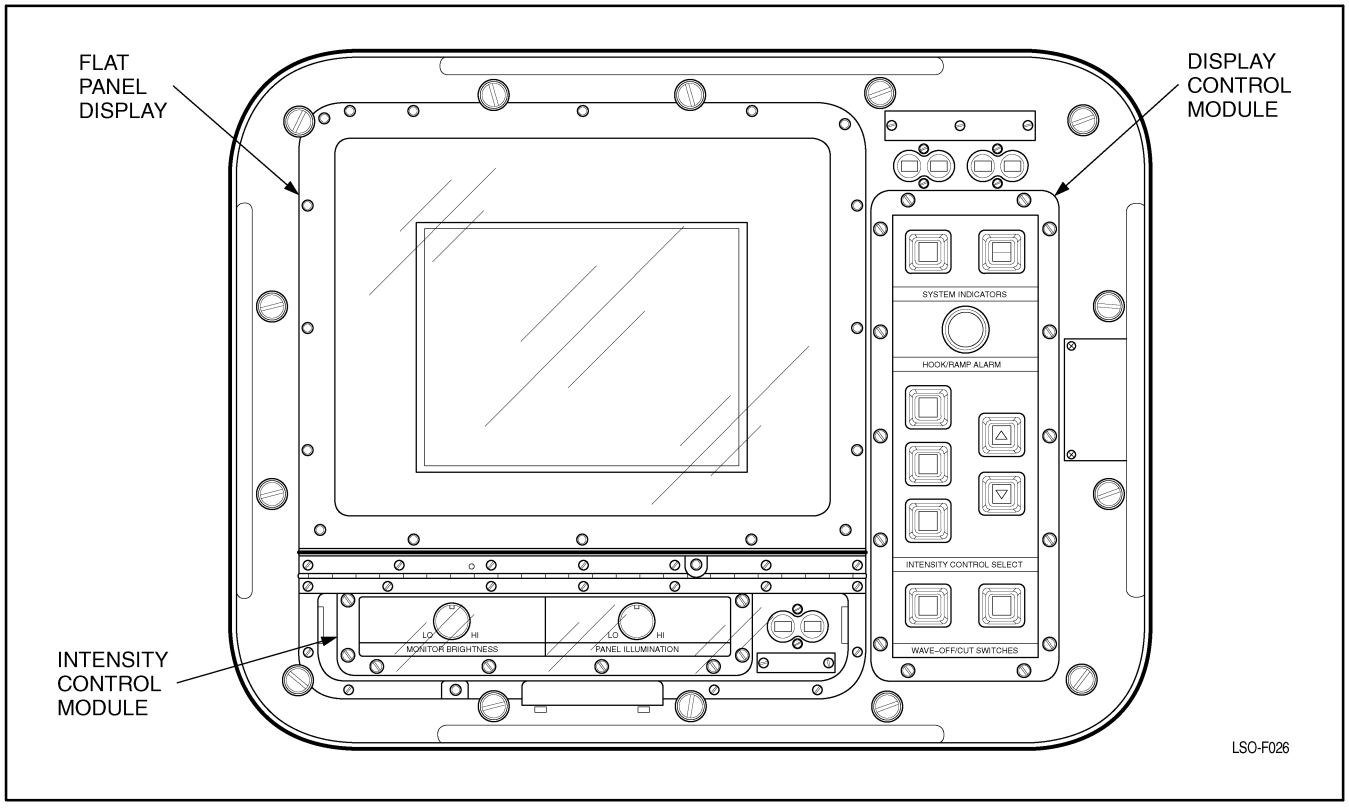

Figure 4-15. LSO Control Panel

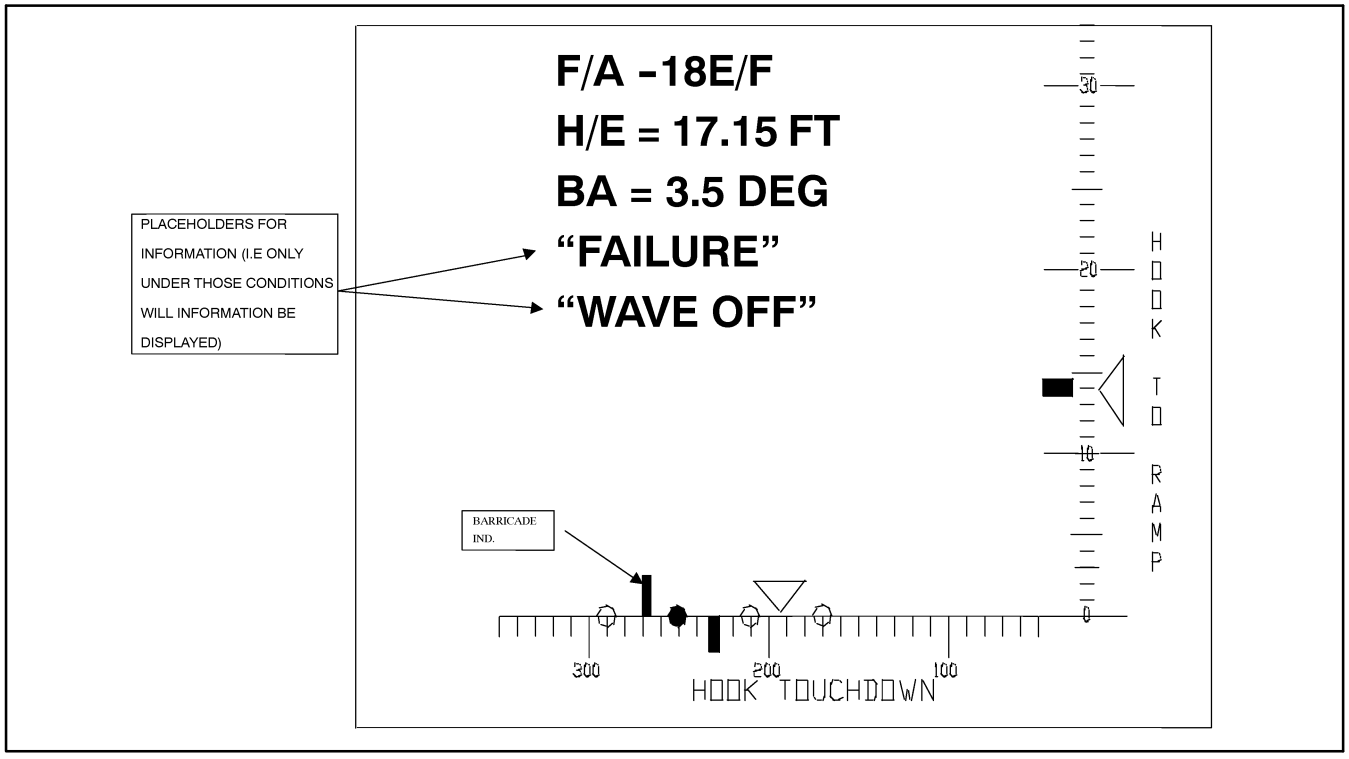

Figure 4-16. LSO Main Screen Display

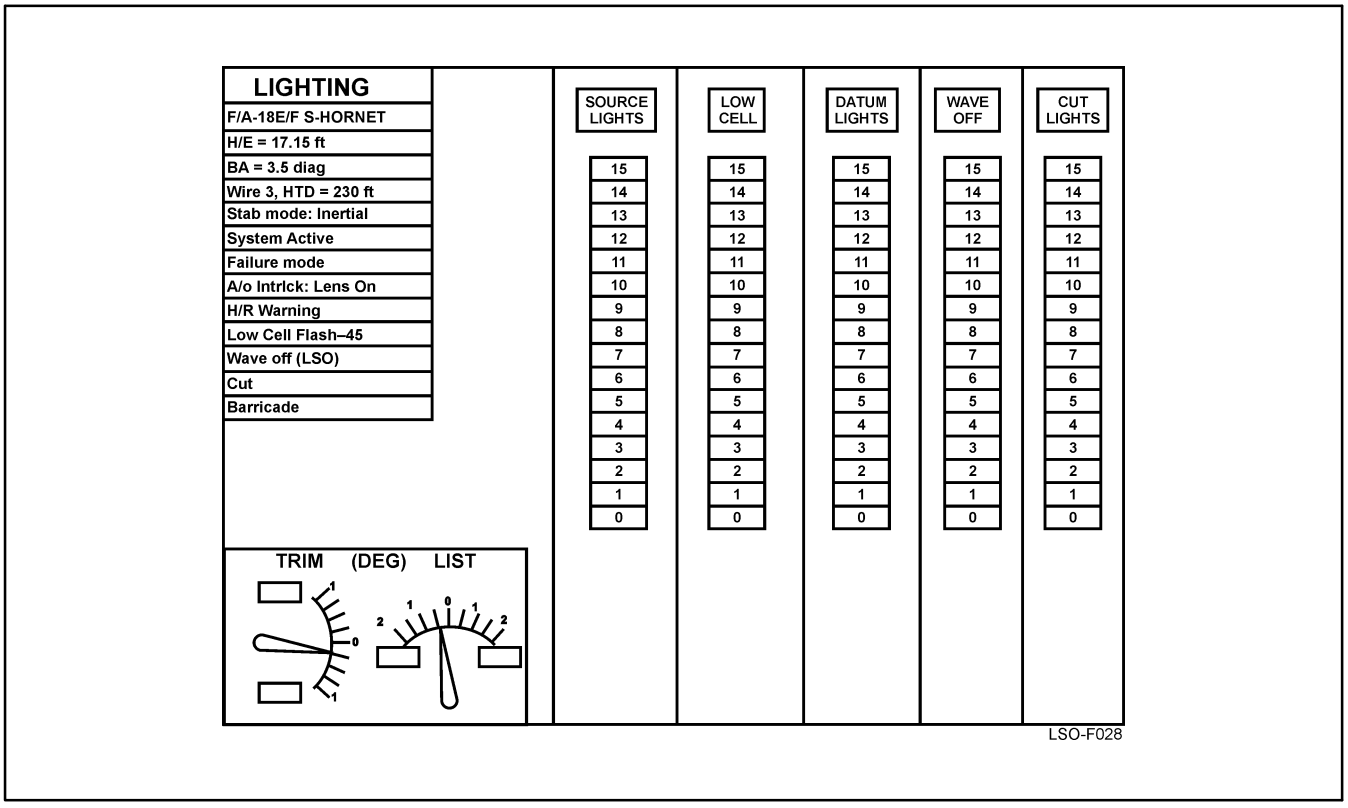

Figure 4-17. LSO Lighting Screen Display

PART III

Normal Procedures

CHAPTER 5

Shore-Based Procedures

5.1 BRIEFING AND DEBRIEFING

5.1.1 Precarrier Briefing

The LSO shall ascertain that pilots/NFOs are thoroughly prepared in all respects for carrier landing operations.

The following subjects shall be covered by the LSO in briefings for pilots/NFOs prior to and, as deemed necessary, during carrier landing operations:

1. Carrier configurations
    a. Recovery systems
        (1) Fresnel lens, MOVLAS, LSO talkdown approaches, and ACLS procedures (if applicable)
            (a) Systems design
            (b) Capabilities
            (c) Limitations
            (d) Special procedures.
        (2) Arresting gear and barricade
            (a) Design
            (b) Capabilities
            (c) Limitations.
    b. Deck configuration
    c. PLAT/ILARTS
    d. Deck, hull, and mast lighting system and control.
2. Communications and communications discipline
    a. Channelization
    b. Voice reports.
3. Carrier operating procedures
    a. Launch and departure procedures
        (1) Deck procedures: Taxi/power considerations
        (2) Catapult procedures

(3) Case I/II/III departure procedures

(4) Voice reports

(5) EMCON

(6) Launch emergencies: Ship, aircraft (consult aircraft NATOPS flight manual).

b. Check-in and marshal procedures

c. Approach procedures

(1) Case I/II/III

(2) CV-1/2/3 approaches

(3) Mode I/IA/II/III ACLS, ASR, self-contained approaches

(4) EMCON/ZIP LIP

(5) Downwind recovery

(6) Voice reports

(7) NORDO aircraft approaches.

d. VFR pattern

(1) Entry

(2) Break (interval)

(3) Downwind

(4) Abeam position

(5) Approach turn

(6) Spin

(7) Delta.

e. Glideslope techniques

(1) Start position

(2) Airspeed/angle-of-attack control

(3) Lineup

(4) Glideslope error corrections

(5) Touchdown

(6) Effects of wind

(7) Effects of deck motion

(8) LSO calls (standard phraseology and responses)

(9) MOVLAS/pitching deck recovery.

f. Bolter

g. Waveoff

(1) Mandatory

(2) Own waveoff

(3) Technique.

h. Night operations

(1) Lack of depth perception

(2) Radar altimeter

(3) Instrument scan/scan transition

(4) Aircraft lighting.

i. Bingo procedures

(1) Fuel state

(2) Profile.

j. Barricade procedures

(1) LSO-to-pilot 10-line barricade brief.

k. Emergency procedures

(1) LSO equipment malfunction

(2) Ship equipment malfunction

(3) Aircraft emergencies

(a) Low fuel state

(b) Hook malfunction

(c) Brake failure

(d) Single engine/compressor stalls

(e) Landing gear malfunctions

(f) Launch bar/tow link malfunctions

(g) Ditching

(h) Fire

(i) Loss of canopy

(j) Flight control malfunctions

(k) Other emergencies from Part V of aircraft NATOPS flight manual.

(4) Ejection.

4. Operations and air department briefings. The following areas should be briefed by cognizant operations and air department personnel prior to CV operations. Student naval aviators shall be briefed by the parent squadron LSO.

   a. Deck handling procedures

   b. Air operations procedures

   c. Communications

   d. Catapult launch procedures

   e. CATCC procedures

   f. SAR procedures.

5.1.2 Simulator Procedures Briefing

The LSO shall conduct a formal briefing with all pilots prior to simulator syllabus flights covering the procedures and training objectives to be accomplished.

5.1.3 Conduct of Field Carrier Landing Practice Briefings

The following subjects shall be covered by the LSO in lectures prior to and, as necessary, during FCLP training:

1. Fresnel lens, MOVLAS, LSO talkdown approaches, and ACLS procedures (if applicable)

   a. Systems design, capabilities, and limitations

   b. Special procedures.

2. Communications and communications discipline

3. General FCLP procedures

   a. Course rules

   b. Pattern, turns, and dimensions

   c. Altitude control

   d. Speed control and angle of attack

e. Attitude control

f. Lineup

g. Landing

h. Night procedures

i. APC control (if applicable)

j. Emergency procedures

k. LSO calls (standard phraseology and responses).

4. Specific FCLP procedures

a. Takeoff/entry

b. Climbout

c. Break (interval)

d. Upwind turn

e. Downwind leg

f. Landing checklist

g. Abeam position: "(Modex), abeam, gear, (fuel state), (pilot's name)"

Note

If unable to call "Abeam, gear" (e.g., gear in transition or aircraft on the ball), make the gear call prior to the ball call on the first pass.

h. Approach turn

i. Voice report (at normal meatball acquisition position)

(1) Modex number

(2) Type aircraft

(3) Ball or Clara

(4) Fuel state (nearest 100 pounds)

(5) Auto (if applicable).

j. Glideslope and entry

k. Glideslope technique

l. Landing

m. Waveoff

(1) Mandatory (including test/close-in waveoff)

(2) Own waveoff

(3) Techniques involved.

n. Aircraft lighting (determined by local conditions)

o. Charlie procedures

p. Bingo procedures

q. Loss of LSO radio or two-way communications

r. NORDO aircraft procedures.

5.1.4 Postsimulator/Postflight Debriefing

The LSO shall debrief each pilot as soon as practicable following each simulator or FCLP flight regarding procedures and landing performance during the period. The LSO should use this debriefing to discuss any significant trends in landing performance and recommended corrective action.

5.2 SIMULATOR TRAINING

Carrier landing simulators shall be used to the maximum extent practicable in preparation for shipboard operations. The LSO shall develop a simulator syllabus to supplement FCLP training and reinforce precarrier briefing material. Each pilot should complete the simulator syllabus prior to carrier operations.

5.2.1 CV Approach/Departure Procedures

The simulator training syllabus should include, at a minimum, one complete case III departure, marshal, ACLS approach, and recovery. Loss of radio procedures should be reviewed and executed. Environmental conditions should be varied and the pilot should be required to execute both precision and nonprecision approaches to minimums.

5.2.2 Emergency Procedures

The carrier landing simulator syllabus should include emergency procedures training in the following areas:

1. NORDO (in all phases of flight)
2. Loss of navigation aids
3. Common aircraft emergencies (peculiar to aircraft type)
4. Aircraft emergencies/abnormal configurations affecting landing performance
5. Shipboard casualties (i.e., failure of navigation aids, drop lights, lens, etc.)
6. Pitching deck recovery
7. Computation of Bingo fuel requirements and execution of Bingo profile.

5.3 FCLP

Field carrier landing practice is defined as that phase of required flight training that precedes carrier landing operations. It should simulate, as nearly as practicable, the conditions encountered during carrier landing operations.

5.3.1 Personnel Requirements

A qualified LSO shall be on station for all day FCLP operations. For night operations, the qualified LSO shall have an assistant (not necessarily an LSO or pilot) present whenever more than two aircraft are in the FCLP pattern.

5.3.2 Traffic Pattern Control Responsibilities

Although tower personnel may be responsible for control of aircraft entering and departing the FCLP pattern and non-FCLP aircraft during concurrent operations, the LSO shall monitor all aircraft in the pattern to ensure proper interval and adherence to briefed FCLP pattern procedures.

5.3.2.1 Traffic Pattern Control Responsibilty at Non-tower Controlled Airfields

At non-tower controlled airfields the LSO, in addition to the primary responsibility of aircraft control from the 180 degree position to touchdown, must be able to safely sequence aircraft into the pattern and maintain situational awareness of pattern traffic as much as operationally feasible. At a minimum, the LSO will transmit “You are number X for the break, number Y in the pattern, and your interval is Z.”

5.3.3 Preflight Briefing

Pilots shall be briefed prior to each FCLP period in accordance with the NATOPS flight manual. The following items are to be included:

1. Takeoff and recovery time
2. Weather briefing
3. Alternate Bingo field
4. Formation procedures
5. Traffic rules and terrain of bounce field
6. Pattern
7. Gross weight limitations
8. Radio discipline
9. Lost communication procedures
10. Field lighting
11. Alternate approach procedures
12. Emergencies
13. Type of field arresting gear and location

14. Waveoff/lineup response
15. No acknowledgment of “ball” call
16. Final recovery instructions
17. Debrief arrangements.

5.3.4 Conduct of FCLP

The following equipment checks shall be made by LSOs prior to FCLP operations:

1. Functional check of visual landing aids (cut and waveoff lights, pole check, intensity, etc.)
2. All lighting facilities for proper operations
3. Radios
4. Aldis lamp or spotlight (night only).

Each pilot shall have demonstrated proficiency in the following:

1. Waveoff — at least one waveoff (technique or test) per FCLP period.
2. Lineup response — at least one test of lineup response per FCLP period.
3. Simulated shipboard radar controlled approaches should be practiced during at least one night FCLP period. Where applicable, FCLP in conjunction with shore-based SPN-42 is highly desirable to familiarize pilots with procedures from an ACLS to visual approach.
4. NORDO approaches — including proper response to cut lights and waveoff lights.
5. MOVLAS approaches.
6. Aircraft simulated emergency approaches.
7. Pilot response to no verbal or visual acknowledgment of the ball call should be frequently tested during FCLP.

Note

During deployed operations, FCLP may be conducted with less than the minimum required equipment at the discretion of the senior cognizant LSO.

5.4 PILOT PERFORMANCE EVALUATION

5.4.1 Minimum Number of FCLP Periods

Chapter 6 establishes the requirement for FCLP refresher prior to carrier operations when a pilot has not made a CV landing in over 30 days. The number of FCLP periods (and total number of FCLP landings) required to prepare a pilot for CV landings will vary with individual pilot skills, experience, and currency in aircraft type. The senior command LSO should submit to the commanding officer, via the operations officer, a list of anticipated FCLP requirements for each pilot prior to commencing precarrier deployment training. This list should also include simulator requirements. These requirements should be adjusted as necessary according to individual performance. The senior command LSO is ultimately responsible for certifying to the commanding officer that an individual is prepared for CV flight operations.

5.4.2 FCLP Performance Records

Fleet squadrons shall maintain records of all squadron pilot FCLP landings from the beginning of shore-based operations until the end of the next extended deployment.

5.4.3 LSO Certification of Pilot Performance

FCLP training shall be completed to the satisfaction of the senior air wing LSO (senior command LSO, if not assigned to an air wing) prior to carrier qualification. During this training period, the pilot should demonstrate his ability to operate with appropriate configurations and simulated emergency conditions. When this has been completed, a written recommendation shall be submitted by the senior LSO to the pilot's commanding officer certifying pilot day/night FCLP qualification. In the case when FCLP refresher is required (per Figure 6-1), the squadron commander shall submit a memorandum to the appropriate air wing commander (for fleet squadrons) or type commander (for TRACOM/FRS squadrons) via the appropriate staff/type LSO prior to the start of CQ operations. Reciprocal acceptance between commands of FCLP qualification and LSO certification is authorized. The senior LSO shall recommend revocation of a certification at any time a pilot's standard of performance is less than satisfactory.

CHAPTER 6

Shipboard Procedures

6.1 BRIEFING AND DEBRIEFING

6.1.1 Carrier Qualification/Currency Landing Procedures Briefing

The carrier configurations, communications and communications discipline, and carrier operating procedures outlined in the precarrier briefing discussed in Chapter 5 shall be completed within 10 days of carrier qualification/currency carrier landings.

6.1.2 Postflight Debriefing

The controlling LSO shall debrief pilots as soon as practicable after all carrier landings. During carrier qualification and currency carrier landing evolutions, the LSO should debrief each pilot, if practicable, concerning his day landing performance prior to night carrier landings.

6.1.3 Pilot Landing Trend Debriefs

The LSO shall periodically debrief each pilot concerning his carrier landing trends. Debriefs should be annotated on the pilot's Carrier Landing Trend Analysis sheet (OPNAV Form 3760/7 1) or APARTS-generated trend analysis forms. For squadrons or detachments cross-decking, the departing air wing staff LSO shall ensure the relieving air wing staff LSO receives trend analyses and written debriefs on all pilots in that squadron or detachment.

6.1.4 Recurrent CV Procedures Training

The LSO should conduct CV procedure training periodically during extended carrier deployments. The training should include, at a minimum, the following portions of the precarrier briefing discussed in Chapter 5.

1. Carrier configurations
2. Communications and communications discipline
3. Carrier operating procedures.

6.1.5 Special Operations Procedures Briefing

The LSO is responsible for briefing procedures pertinent to special carrier recovery operations (day/night EMCON, E-2 controlled approach, etc.).

6.2 DEFINITIONS

1. Undergraduate carrier qualifications — Pilot's first day carrier qualifications prior to designation as a Naval Aviator.
2. Initial carrier qualifications — Pilot's first day or day/night carrier qualification as a designated Naval Aviator.
3. Transition qualification — A previously carrier qualified Naval Aviator who has not been current in model for more than four years or is attempting first qualification in model.
4. Requalification — Pilot's day/night currency in type and model exceeds 365 days but less than four years or pilot is attempting qualification in a new aircraft series of the same model.

6.3 CARRIER QUALIFICATIONS

6.3.1 Purpose

The purpose of carrier qualifications is to give pilots a dedicated opportunity to develop fundamental skills associated with operating fixed wing, carrier based aircraft and demonstrate acceptable levels of proficiency required for qualification.

6.3.2 Requirements

6.3.2.1 Undergraduate Carrier Qualification

1. 14 day landings, 10 of which shall be arrested.

CAUTION

To reduce the risk of inflight engagement or hook slap, pilots undergoing undergraduate carrier qualification shall execute a minimum of one touch and go landing prior to attempting an arrested landing.

6.3.2.2 Initial Carrier Qualification

1. 12 day landings, 10 of which shall be arrested.

CAUTION

To eliminate the risk of inflight engagement or hook slap, pilots attempting initial carrier qualification should execute a minimum of one touch and go landing prior to making a day arrested landing.

2. 8 night landings, 6 of which shall be arrested.

CAUTION

To eliminate the risk of inflight engagement or hook slap, pilots attempting initial carrier qualification should execute a minimum of one touch and go landing prior to making a night arrested landing.

6.3.2.3 Transition Qualification

1. 12 day landings, 10 of which shall be arrested.

CAUTION

To eliminate the risk of inflight engagement or hook slap, pilots attempting transition carrier qualification should execute a minimum of one touch and go landing prior to making a day arrested landing.

2. 6 night arrested landings.

6.3.2.4 Requalification

1. 6 day arrested landings.
2. 4 night arrested landings.

6.3.3 Limitations for Carrier Qualifications

1. A qualifying pilot shall not exceed in any period of continuous flight duty (crew day), as defined by OPNAVINST 3710.7 series:

   a. Six and one-half hours in the cockpit

   Note

   For E-2 and C-2 aircraft, the 6.5-hour rule shall apply to left-seat time (pilot at the controls) only.

   b. Three flights.

   Note

   A flight begins with the first field takeoff or carrier catapult launch and ends when (1) the pilot makes his last arrested landing on the carrier in that aircraft, or (2) makes a full stop landing at a field facility. A CQ period that ends with a divert or bingo shall be counted as one flight.

   c. Pilots attempting initial or transition carrier qualifications shall not exceed:

      (1) Ten arrested landings.

      (2) Four night arrested landings.

2. Pilots attempting initial or transition carrier qualification shall complete a minimum of eight day landings, six of which shall be arrested, prior to participating in night carrier qualification. Pilots attempting requalification shall complete a minimum of six day arrested landings prior to participating in night carrier qualification. Following completion of the required minimum day landings, the LSO may recommend to the carrier commanding officer that the pilot participate in night qualification landings. Participation in night qualification landings in no way represents pilot day qualification. If the controlling LSO considers that a pilot's performance warrants additional landings, such recommendation shall be made to the carrier commanding officer.

3. Pilots attempting initial carrier qualification shall complete a minimum of two successful carrier landings (no bolters), at least one of which shall be arrested, and one catapult launch during the daylight hours preceding night qualification landings. Pilots attempting transition qualification or requalification will be considered to have satisfied this requirement for a period not to exceed 36 hours after the first night qualification landing.

4. Carrier qualifications should commence within 5 days of FCLP and no longer than 10 days shall elapse between the last FCLP period and the first carrier landing. All FCLP periods shall be conducted on a Mk. 14 IFLOLS equipped runway.

5. Carrier qualification shall be completed within a 30-day period.

6. During the first night of initial or transition night qualification, qualifying pilots shall have a minimum of 20 minutes of flight time prior to their first night landing of that night. This requirement is optional on subsequent nights.

7. Carrier qualification for fixed-wing aircraft shall be conducted within divert range of a suitable shore facility airfield with not less than circling minimums. If any part of the descent is IFR, sufficient fuel must be included for a standard instrument penetration and approach. It is the responsibility of each participating unit to guarantee that valid Bingo information for their particular aircraft is available and in use aboard the carrier.

8. All case III operations shall be CATCC controlled.

9. Multiplace carrier aircraft shall carry only a minimum flightcrew aboard during carrier qualification landings. Qualification landings shall not be conducted with qualifying pilots aboard other than the pilot and/or copilot, except for necessary transportation to/from the ship.

10. For qualification purposes, a landing within one-half hour of sunrise or sunset shall not be counted as a night carrier landing unless it is quite dark (e.g., because of cloud coverage). The senior cognizant LSO shall make this determination.

11. Carrier qualifications shall normally be conducted with a minimum ceiling of 1,000 feet and 3 statute miles visibility. When authorized by the OTC, carrier qualification landings may be conducted with a ceiling of not less than 700 feet and not less than 3 statute miles visibility.

12. Carrier qualification should not be conducted with recovery headwinds less than 20 knots or greater than 40 knots.

13. Deck movement should not exceed ±3 feet of ramp motion. The decision to continue qualification landings when deck motion exceeds ±3 feet rests with the carrier commanding officer. The senior LSO shall observe the frequency and magnitude of the deck movements and advise the carrier commanding officer on any degredation to training or increased safety risk. Deck motion shall not exceed ±6 feet of ramp motion.

14. The number of airborne aircraft in the case I or II pattern should be limited to four and shall not exceed six.

15. During case III operations, CCA shall utilize a single frequency to control all aircraft in the case III pattern.

16. The LSO shall make timely divert recommendations to the air officer based on unsatisfactory pilot performance or unsatisfactory training conditions around the ship.

17. Aircraft or equipment parked forward of the LSO platform shall not obstruct the LSO's ability to observe any part of the landing area.

6.4 CURRENCY

6.4.1 Purpose

The purpose of currency landings is to give pilots a dedicated opportunity to refresh skills in the fundamental phases of carrier aviation prior to multi-mission tasking. Currency landings should provide an opportunity for each pilot to exercise carrier launch, recovery, and flight deck procedures in preparation for tactical operations from the aircraft carrier. There is no performance requirement associated with currency landings, and accomplishment of minimum currency requirements established by Figure 6-1 does not imply adequate pilot proficiency.

6.4.2 Requirements For Currency Landings

1. Operating criteria for currency landings are contained in Figure 6-1.

DAY					
DAYS SINCE LAST DAY or NIGHT CURRENT	**REQUIREMENTS PRIOR TO A DAY LANDING**	**WEATHER**	**DECK**	**DIVERT FIELD**	**CURRENCY REQUIREMENT**
1–14 days	FCLP not required	Ships mins	ALL conditions	N/R	1 arrested landing
15–29 days	FCLP refresher at the discretion of the squadron commanding officer.	TACAN mins	Relatively steady(1), or	Divert available	1 arrested landing
30–59 days	FCLP refresher	TACAN mins	Relatively steady(1), or	Divert available	1 arrested landing
60 to 179 days	FCLP refresher	TACAN mins	Relatively steady(1), and	Divert available	2 arrested landings (2)
180–365 days	FCLP refresher	700/3	Relatively steady(1), and	Divert available	4 landings 2 shall be arrested(2)
Greater than 365 days	Refer to Requalification				

NIGHT (3)					
DAYS SINCE LAST NIGHT CURRENT	**REQUIREMENTS PRIOR TO A NIGHT LANDING OR NIGHT CAT SHOT(5, 6)**	**WEATHER**	**DECK**	**DIVERT FIELD**	**CURRENCY REQUIREMENT(4)**
1–7 days	None	Ships mins	ALL conditions	N/R	1 arrested landing
8–14 days	1. One arrested landing, one day cat shot and not less than one hour of flight time within a 48 hour period prior to the night landing	TACAN mins	ALL conditions	N/R	1 arrested landing
15–29 days	1. Two day landings, one of which shall be arrested, within a 48 hour period prior to the night landing. 2. After 48 hours, one cat shot(4) in the day light hours preceding the night landing, and not less than 1 hour of flight time (day or night).	TACAN mins	Relatively steady(1), or	Divert available	1 arrested landing
30–59 days	1. Four day landings, two of which shall be arrested, within a 48 hour period prior to the first night arrested landing. 2. After 48 hours, one cat shot(4) and arrested landing during the daylight hours immediately preceding the night landing, and not less than 1 hour of flight time (20 minutes of which should be at night).	700/3	Relatively steady(1), and	Divert available	1 arrested landing
60 to 179 days	1. Four day landings, two of which shall be arrested, within a 48 hour period prior to the first night arrested landing. 2. After 48 hours, one cat shot(4) and arrested landing during the daylight hours immediately preceding the night landing, and not less than 1 hour of flight time (20 minutes of which should be at night).	700 /3	Relatively steady(1), and	Divert available	2 arrested landings
180 to 365 days	1. Four day landings, two of which shall be arrested, within a 48 hour period prior to the first night arrested landing. 2. After 48 hours, one cat shot(4) and arrested landing during the daylight hours immediately preceding the night landing, and not less than 1 hour of flight time (20 minutes of which should be at night).	700 /3	Relatively steady(1), and	Divert available	2 arrested landings(7)
Greater than 365 days	Refer to Requalification				

Note 1 — less than ±6 feet of ramp movement at the centerline.

Note 2 — Currency requirements must be completed prior to any landings with passengers.

Note 3 — A landing within ½ hour of sunset shall not be counted as a night carrier landing unless it is quite dark due to cloud coverage.

Note 4 — For multi-piloted aircraft with two aviators qualified in model at the controls, catapult launches may be counted by both pilots for refresher catapult shot criteria.

Note 5 — A carrier qualified aviator whose intention is to depart the carrier may take a night catapult shot if he has completed one day landing and one cat shot during the 48 hours preceeding the night cat shot, or 4 day landings within 72 hours.

Note 6 — The requirement for 1 hour of flight time does not apply to the night catapult shot.

Note 7 — Pilots who have logged fewer than 50 night arrested landings in model require 4 arrested landings for night currency.

Figure 6-1. Operating Criteria for Qualified Pilots

6.4.3 Limitations For Currency Landings

In addition to the criteria established in Figure 6-1, the following is applicable:

1. Operating criteria of Figure 6-1 for multipiloted aircraft shall apply to the pilot at the controls. However, a divert field is not required if the qualifying pilot has been night current within 59 days, both pilots are NATOPS qualified in model, and one pilot is night current.
2. When FCLP refresher is required, no longer than 10 days shall elapse between the last FCLP period and the first carrier landing. All FCLP periods shall be conducted on a Mk. 14 IFLOLS equipped runway.
3. In maintaining night currency, Mode I approaches shall be closely monitored to ensure that consecutive Mode I approaches do not adversely affect pilot proficiency. Mode I approaches shall not be used to regain night currency once such currency has lapsed.
4. Flightcrew composition for any currency landing shall be at the discretion of the squadron commanding officer. However, qualification landings shall not be conducted with qualifying pilots aboard other than the pilot(s) at the controls, except for necessary transportation to/from the ship.
5. For currency purposes, a landing within one-half hour of sunrise or sunset shall not be counted as a night carrier landing unless it is quite dark (e.g., because of cloud coverage). The senior cognizant LSO shall make this determination.
6. For day or night currency landings, MOVLAS may be utilized to recover aircraft if deck movement or stabilization limits preclude normal use of the IFLOLS within the limits of Figure 6-1. Use of the MOVLAS in such circumstances shall be predicated on LSO currency/proficiency in MOVLAS control, as determined by the senior cognizant LSO.

6.4.4 Limitations For Dual Currency

For currency in more than one aircraft, the following definitions and limitations apply:

1. A pilot who has a minimum of 750 hours and 150 arrested landings at the controls in model shall consider that aircraft a “primary” aircraft.
2. A pilot with fewer than 750 hours or 150 arrested landings at the controls in model shall consider that aircraft a “secondary” aircraft.
3. For purposes of regaining currency in any aircraft, all day requirements prior to night landings shall be flown in that model and series.

6.4.5 Currency and Qualification Requirements

1. Aircraft series — for the purposes of determining currency, the following groups of aircraft shall be considered one series:
   a. T-45A and T-45C
   b. F/A-18A thru D
   c. F/A-18E, F/A-18F, and EA-18G
2. Aircraft series — for the purposes of determining qualification requirements, the following groups of aircraft shall be considered one series:
   a. T-45A
   b. T-45C
   c. F/A-18A thru D
   d. F/A-18E, F/A-18F, and EA-18G

3. Pilots who maintain currency in more than one model aircraft shall remain current in their secondary aircraft according to the requirements of Figure 6-1.

   a. Day currency: Once day current in the secondary aircraft, the following requirements apply to the primary aircraft:

      (1) 1—14 days: 1 arrested landing in primary or secondary aircraft.

      (2) 15—59 days: 1 arrested landing.

      (3) 60—365 days: FCLP refresher and 1 arrested landing.

   b. Night currency: Once night current in the secondary aircraft, the following requirements apply to the primary aircraft:

      (1) 1—7 days: 1 arrested landing in primary or secondary aircraft.

      (2) 8—14 days: 1 arrested landing.

      (3) 15—59 days: refer to 15—29 days requirements of Figure 6-1.

      (4) 60—365 days: refer to 30—59 days requirements of Figure 6-1.

4. Pilots who maintain currency in more than one series of the same model aircraft shall regain currency in one series, according to the requirements of Figure 6-1:

   a. Day currency: Once day current in one series, the following requirements apply to the other series:

      (1) 1—14 days: 1 arrested landing in either series.

      (2) 15—59 days: 1 arrested landing.

      (3) 60—365 days: FCLP refresher and 1 arrested landing.

   b. Night currency: Once night current in one series, the following requirements apply to the other series:

      (1) 1—7 days: 1 arrested landing in either series.

      (2) 8—14 days: 1 arrested landing.

      (3) 15—59 days: refer to 8—14 days requirements of Figure 6-1.

      (4) 60—365 days: refer to 30—59 days requirements of Figure 6-1.

5. For dual currency situations not covered by this section, assume Figure 6-1 currency requirements for both aircraft. For questions on this section refer to the LSO NATOPS Model Manager at the LSO School.

6.5 LSO CERTIFICATION OF PILOT PERFORMANCE

The senior LSO shall report orally and in writing when individual pilots have completed day/night carrier qualification. The originals of such reports shall be delivered to the appropriate squadron commanding officer or wing commander who will certify the pilot as day/night carrier qualified. Copies shall be provided for pilot training jackets and LSO files. Reciprocal acceptance between commands of carrier qualification and LSO certification is authorized. The senior LSO may recommend revocation of a qualification anytime a pilot's standard of performance is less than satisfactory.

6.6 NORMAL RECOVERY OPERATIONS

The primary responsibility for determining acceptable pilot performance during the final approach to the carrier rests with the LSO.

6.6.1 Personnel Requirements

The following personnel are required on the LSO platform for day Case I/II operations:

1. A Wing qualified LSO.
2. A qualified enlisted phone talker.
3. A qualified enlisted hook spotter.

The following personnel are required for night/CaseIII recovery operations:

1. A Wing qualified LSO.
2. An assistant LSO.
3. A qualified enlisted phone talker.
4. A qualified enlisted hook spotter.

The following personnel are recommended for all recovery operations:

1. A bookwriter
2. The deck caller

Note

The presence or absence of the deck caller is not an indication of clear/foul deck.

When the CV/N CO, CAG and CAG LSO desire to use the deck caller position, it is to be manned by a qualified LSO team member that has undergone proper training by the air wing staff LSO. Specific responsibilities of the deck caller are:

a. Stand in a position visually in front of the controlling LSOs with an unobstructed view of the angle deck and signal if men or equipment are in the landing area.

b. Signal an obstruction in the landing area (LA) by raising his hand over his head

c. When all obstructions are clear of the LA, he lowers his hand and moves behind the controlling and backup LSOs, where he continues to monitor deck status for the remainder of the pass.

Used in this way, it is a direct indication to the controlling and backup LSOs that the waveoff window is either one hundred feet (obstructions in the LA) or ten feet (no obstructions in the LA). If the landing area is obstructed in any manner at the 100-foot waveoff point, the controlling or backup LSO shall wave the aircraft off. The deck caller shall not be used as an indicator of clear or foul deck. The arresting gear officer is the sole person designated to indicate clear/foul deck status (LA clear, arresting gear in battery and set for the correct aircraft) and signals this to all parties via the deck status lights. When the deck is foul due to obstructions in the landing area, or the IFLOLS is not

configured correctly for the approaching aircraft, the deck caller is only indicating that the 100-foot clearance waveoff window shall be used. With no deck obstruction, waveoffs are predicated on the conditional factors of the approaching aircraft, but in no case will the clearance be less than 10 feet if the deck is foul.

WARNING

If the IFLOLS roll angle is not set correctly for the type aircraft approaching the ship, unsafe glideslope deviations may result.

If a deck caller is not available, a 100-foot clearance waveoff window shall be used.

6.6.2 LSO Responsibilities

These responsibilities include:

1. While embarked aboard the carrier, duty LSOs shall keep the air officer informed of their whereabouts during flight quarters.
2. Upon reporting aboard a carrier for carrier operations, the LSO should meet with the air officer and CATCC officer to discuss the conduct of air operations in the LSO's area of responsibility.
3. The senior embarked LSO is responsible for the proper indoctrination and training of the LSO phone talkers and hook spotters. Specific job responsibilities for phone talkers and hook spotters shall be defined by the senior LSO.

Additionally, the senior LSO on the platform shall ensure the proper training and procedures of the required enlisted watchstanders.

a. Enlisted PHONE TALKER — Has the primary responsibility for informing LSOs of the status of the arresting gear, weight setting, wire run-out, and wire number and shall be tied into the arresting gear sound powered (6JG) phone circuit. It is their responsibility to call "foul deck" when gear is not in battery and any aircraft is in the groove. The tone and volume of these calls shall increase as the aircraft nears the waveoff window. These calls shall only cease when the deck becomes clear or the aircraft is waved off.

b. Enlisted HOOK SPOTTER — Responsible to check aircraft at the 180 (Case I/II) or prior to 1 nm (Case III) position for proper configuration and call: "aircraft type, gear configuration" and call: "aircraft type, gear down, hook up/down, and good/flashing approach light". They shall be tied to PriFly, CCA, IFLOLS, and ILARTS control rooms via sound powered (11JG) phone circuit. The Hook Spotter shall call "Lens set, aircraft type" for each approach. They shall also notify the LSOs of any IFLOLS or ILARTS degrade or failure.

4. The senior LSO on the platform is responsible for the conduct of all platform operations and ensuring all team members are thoroughly briefed regarding platform procedures.
5. The senior cognizant LSO on the platform shall at all times ensure that the assigned controlling and backup LSOs are of sufficient experience and qualification level given the present operational situation. Factors that should be considered in determining controlling and backup LSO assignments include, but are not limited to, the following:

a. Day/night recovery operations.

b. Weather and environmental conditions (ceiling, visibility, winds).

c. Deck motion.

d. MOVLAS proficiency (if MOVLAS in use).

e. LSO platform equipment malfunctions (e.g., PLAT, HUD, radio).

f. Pilot proficiency/currency.

g. Aircraft fuel state, aircraft with multiple approaches.

h. Aircraft malfunctions.

i. LSO currency in controlling type aircraft recovering.

j. Shipboard equipment malfunction (e.g., missing CDP).

k. Deck conditions (e.g., obscured lineup reference, static mistrim).

l. Type of recovery operations (e.g., CARQUAL, CARQUAL refresher, normal embarked operations, EMCON operations).

The senior cognizant LSO on the platform is ultimately responsible for balancing the need to conduct LSO training with the operational realities of the current situation. When conducting LSO training, close supervision by a wing- or staff-qualified LSO is required. The supervising LSO, if not specifically functioning as the controlling or backup LSO, may consider utilizing a third UHF handset and/or pickle while conducting training of junior LSOs.

6. The LSO shall make the following equipment checks prior to recovery operations:

   a. Functional check of visual landing aids.

   b. All lighting facilities for proper operation (centerline, landing area lights, and deck status lights).

   c. Radio check prior to each recovery (EMCON permitting).

   d. Relative wind indicator.

   e. Sound-powered phones.

   f. Windscreen operation.

   g. Escape net condition and evacuation route.

   h. Platform safety equipment.

   i. Aldis lamp or spotlight (night only).

   j. LSO HUD.

   k. PLAT/ILARTS on and adjusted. Verify camera alignment with centerline and check for reverse image display.

7. The air officer/LSO shall keep each other informed concerning conditions that affect the recovery of aircraft, including malfunctioning or inoperative equipment, aircraft emergencies, wind and weather conditions, and ship's trim and list.

8. During recovery operations, LSO responsibilities include the following:

   a. Controlling all fixed-wing aircraft approaches after the 180° position.

   b. Ensuring that approaching aircraft are properly configured.

   c. Monitoring the operation of the IFLOLS and crosschecking the approach radar/ILS glidepath angle setting.

d. Assisting in controlling aircraft that have radio failure by flashing the cut or waveoff lights in accordance with standard NATOPS visual signals.

e. Whenever possible, maintaining visual contact with all aircraft in the Case I/II/III pattern.

f. Monitoring wind-over-deck and deck motion.

g. Assisting pilots through informative, advisory, and imperative communications to maintain approach parameters within acceptable limits.

h. Monitoring arresting gear settings, lens settings, and deck status.

i. Evaluating aircraft approach performance and recording deviations for postflight pilot debriefs.

j. Determining acceptable aircraft performance during the final approach, and waving off aircraft that exceed or will exceed acceptable approach parameter limits.

9. The LSO should be familiar with the landing characteristics of each aircraft under his control as described in the individual aircraft's NATOPS flight manual. Additionally, he should have a working knowledge of the effects of aircraft malfunctions upon approach configuration and speed, pilot workload, and flight characteristics.

10. It is the LSO's responsibility to wave off aircraft in sufficient time for the pilot to effect a safe maneuver utilizing standard procedures. Waveoffs necessitated by poor pilot technique that could result in an in-flight engagement shall only be initiated by the LSO.

6.6.3 Recovery Procedures for Final Approach

The pilot shall be familiar with procedures pertaining to the carrier landing pattern and approaches delineated in Chapter 5 of the CV NATOPS Manual.

6.6.3.1 Specific LSO and Pilot Recovery Procedures

1. Transition to LSO control occurs at the 180° position in the Case I/II pattern, at 3/4 nm for a Case III precision approach (1-1/4 nm for a jet/1 nm for a turboprop nonprecision approach), or upon transmission of "Paddles contact".

2. The LSO radio transmission "Paddles contact" may occur any time during an approach when the LSO visually determines that an aircraft requires additional control to arrive within acceptable start parameters. Once "Paddles contact" has been transmitted, the LSO assumes control and CATCC should refrain from further transmissions until the completion of the approach, or at such time the LSO elects to return the aircraft to CATCC control.

3. In the Case I/II pattern, the LSO shall monitor each aircraft's approach turn from the 180° position. He shall immediately wave off any aircraft that will fly too short a groove length. For Case III approaches, the LSO should monitor each aircraft's CCA and be prepared to initiate "Paddles contact" control.

4. At the normal "Ball" call position (i.e., rolling wings level in the groove for Case I/II, or at approach minimums for Case III), when the pilot has usable IFLOLS or MOVLAS, lineup, and angle of attack reference, the following shall be transmitted (if not EMCON or ZIP LIP): Modex number, type aircraft, "Ball", fuel state to the nearest hundreds pounds, "Auto"/"Coupled" (if applicable). If the pilot does not have glideslope reference (e.g., no ball, sun glare, or poor visibility), then the call "Clara" shall replace the ball call. If the pilot does not have usable lineup information (e.g., wet landing area, sun glare, or poor visibility), then the call "Clara lineup" shall be transmitted.

WARNING

If the IFLOLS roll angle is not set correctly for the type aircraft approaching the ship, unsafe glideslope deviations may result.

5. If the pilot is experiencing any aircraft difficulty that may significantly affect his ability to fly a safe approach and landing, he shall make every effort to notify the ship (through CATCC, Marshal, Tower, etc.) prior to final approach. In any case, he shall inform the LSO of the difficulty at the "Ball" call. Such difficulties are not limited to aircraft configuration problems alone; loss of primary attitude reference, angle of attack malfunction, controllability problems, pilot vertigo, or other difficulties that may necessitate additional LSO assistance should be conveyed.
6. The pilot shall report loss of meatball (i.e., "Clara"); if no timely amplifying verbal information is received from the LSO, he shall initiate his own waveoff.
7. If APC is disengaged or a Mode I approach is downgraded, "Manual" or "Downgrading" should be reported.
8. During ZIP LIP or EMCON conditions, or for a NORDO aircraft, the LSO shall acknowledge control of the aircraft on final approach with a steady (3-second) flash of the cut lights. In doing so, the LSO is also acknowledging that the pilot has meatball acquisition, lineup reference, and angle of attack. Subsequent flashes of the cut lights by the LSO command a pilot response of adding power, the degree of which is indicated by the duration of the cut light signal.

6.6.4 Foul Deck Waveoff

The waveoff point is defined as a moving window through which the aircraft passes and is the latest point where normal pilot technique will result in a safe waveoff. Many factors must be considered in determining this point, including aircraft/engine performance, approach dynamics, and environmental conditions (i.e., sink rate, angle of bank, deck movement, visibility).

Foul deck waveoff responsibility rests equally with the controlling and backup LSOs. Additionally, when in the opinion of the air officer, the deck will remain foul throughout an aircraft's approach (i.e., arresting gear malfunctions, personnel or equipment in the landing area, etc.), he should advise the LSO via the 5MC, "No chance" The LSO shall initiate the waveoff immediately following the "Ball" call using the IFLOLS/MOVLAS waveoff lights and a UHF radio transmission (EMCON permitting).

With an aircraft crossing the ship's wake during Case I/II operations, or with an aircraft approaching 3/4 nm during Case III operations, the controlling and backup LSOs shall each raise their pickle switch arm above their heads as a visual signal to request a clear deck signal from the Arresting Gear Officer (AGO) (except for MOVLAS, when the backup LSO is the only LSO to raise his arm). The LSOs shall lower their arms only upon receipt of a clear deck signal, or upon waving off the approaching aircraft for a foul deck.

During normal recovery operations, the LSO shall initiate a foul deck waveoff such that normal waveoff response will allow the aircraft to pass no closer than 10 feet to the landing area. If aircraft, personnel, or equipment are in the landing area, or if the IFLOLS lens setting is not set for the aircraft attempting the arrested landing, the waveoff shall prevent the aircraft from passing within 100 feet of the highest obstacle in the landing area.

WARNING

If at any time doubt exists as to the condition causing a Foul Deck, in the interest of safety, 100 feet window SHALL be the default.

6.6.5 Optical Landing System Limits

The LSO must be cognizant of the stabilization limitations of the IFLOLS. Stabilization limits vary with individual IFLOLS, pitch severity, pitch rate, and associated roll and heave. The LSO shall consider utilizing MOVLAS when IFLOLS stabilization has, in the LSO's estimation, been exceeded. The recommendation to utilize MOVLAS must take into account air wing MOVLAS currency and response, LSO MOVLAS proficiency, and all environmental conditions.

6.6.6 Wind Over Deck (WOD) Requirements

Optimum and minimum RHW information is contained in Aircraft Recovery Bulletin Nos. 10-10-, 26-, and 29-series. RHW should be maintained as close as possible to the optimum velocity and the centerline of the landing area.

CAUTION

The LSO shall immediately inform the air officer of any adverse wind conditions unsafe to aircraft recovery, and the air officer shall inform the LSO of downwind recovery situations. EMCON conditions permitting, pilots shall be advised of adverse wind conditions or downwind recoveries.

6.6.7 Safety Precautions

The LSO platform shall be manned when directed by the air officer, and at all times when he broadcasts, "Man all recovery stations". If access to the LSO platform is obstructed (e.g., by turning aircraft spotted for launch), the LSO team shall be readily available to man their recovery station as soon as the area becomes clear. Once the LSO platform is manned with the required personnel of paragraph 6.4.1, the LSO shall report "manned and ready" to the air officer. The LSO platform shall be manned and ready prior to activation of the OLS for fixed-wing recoveries. Operation of the OLS for use as a reference for V/STOL aircraft will not normally require the presence of a fixed-wing LSO.

If, during launch or recovery operations, any part of the aircraft strikes the ramp, aircraft, or equipment on deck or ship's structure other than normal flight deck protrusions (crossdeck pendants, flight deck light covers, ILARTS centerline cameras, PLAT heads, or waist catapult ramp), no further effort shall be made to effect a normal carrier arrestment. A divert or barricade is required in this case.

6.6.8 MOVLAS Training

LSOs shall acquaint themselves and receive adequate training with the MOVLAS ashore prior to using it aboard ship. To maintain proficiency with the MOVLAS, air wing staff LSOs should conduct at least one day and one night MOVLAS period per day during normal cyclic operations.

6.6.9 MOVLAS Operating Procedures

Positioning the MOVLAS ball to indicate proper glidepath tasks the LSO's ability to monitor all required safety parameters concurrently (i.e., landing area, deck status light, wind, aircraft glideslope, lineup, airspeed, PLAT, MOVLAS repeater, pitching deck, etc.). LSO scan breakdown can occur even under ideal conditions. Added difficulty occurs when attempting to lead pilot-induced excessive sink rates or when accentuating ball movement. To optimize the safe recovery of aircraft utilizing the MOVLAS the following procedures shall be used:

1. EMCON conditions permitting, pilots shall be advised when unplanned MOVLAS recoveries, whether practice or actual, are in progress and station location of the MOVLAS.

WARNING

- During night/Case III recovery operations, failure to notify pilots of MOVLAS recovery may result in dangerous situations if pilots respond to glideslope indications intended for other aircraft.
- The range/rate of MOVLAS MK1 Mod2 indications does not accurately represent that of the IFLOLS and may affect the pilot's perception of glideslope.

Note

MOVLAS recoveries under EMCON conditions may result in mandatory LSO radio transmissions because of safety-of-flight considerations.

2. When the MOVLAS is installed at station 1, turn off the IFLOLS source light to preclude double images. Although IFLOLS Source and Low Cell lights will be extinguished, the hook-to-ramp and hook-touchdown dynamic needles are still active on the IFLOLS Lens and Pri-Fly MAIN screen displays as well as the LSODS IFLOLS MAIN screen display during MOVLAS MODE.
3. Monitor subsequent aircraft on final (especially during Case III operations) to preclude multiple aircraft from flying the same ball.
4. After aircraft touchdown or when not under positive control, the control handle should be lowered to the full-down position, displaying a low red ball, until the next aircraft is under LSO control.

The upper and lower MOVLAS power lamp on/off switches enable/disable power to the upper and lower three MOVLAS lamps, respectively. Placement of the MOVLAS control handle to the full-up or full-down position will display an amber ball or red ball, respectively, if that power lamp switch is in the ENABLED ON position. Conversely, placement of the MOVLAS control handle to the full-up or full-down position will not display a ball if that respective power lamp switch is in the OFF position.

WARNING

The lack of visual glideslope information for aircraft not under positive LSO control (as with the MOVLAS controller handle in the full-up or full-down position and the respective lamp switch disabled) may result in an unsafe deviation below glidepath if the pilot attempts to correct for a perceived "Clara" high condition.

5. Upon initiating a technique waveoff with the pickle switch, the LSO shall immediately transmit a "waveoff" over UHF and lower the MOVLAS control handle to the full-down position.
6. Caution shall be exercised when using station 3 (starboard side) because of scan breakdown (especially with left-seat-piloted aircraft).
7. During night/no-horizon pitching deck operations, the only source of information concerning deck movement or ship's trim is the HUD ramp motion indicator. The LSO's ability to accurately determine and present glideslope information via MOVLAS is significantly reduced. Under this circumstance, timely placement of plane guard ship/helicopter or flares/light sonobuoys to give an artificial horizon reference for the LSO is recommended

PART IV

Emergency Procedures

CHAPTER 7

Emergency Procedures

7.1 INTRODUCTION

This chapter outlines the procedures to be followed in the event of an emergency situation or an equipment malfunction during FCLP or carrier landing operations. It supplements the doctrine set forth in other NATOPS manuals. Aboard ship, the LSO shall immediately advise the air officer whenever a malfunction is suspected or known so that corrective action can be initiated. Shore-based equipment malfunctions shall be reported to the commander fleet air detachment or station operations officer, as appropriate.

The LSO (field) and air officer (at sea) should delta aircraft in the landing pattern when an emergency aircraft is within 3 miles of landing so that the emergency aircraft has a clear landing area.

Note

Procedures described herein are intended for use to safely recover aircraft already airborne. Every effort should be made to correct existing malfunctions. Continued operations under such conditions or with malfunctioning equipment is not recommended.

7.2 SHORE-BASED EMERGENCIES

7.2.1 FCLP Pattern Emergencies

1. Loss of LSO radio

   a. If FCLP aircraft can continue in the landing pattern under tower control, FCLP landings may continue at the discretion of the controlling LSO.

   b. The bingo signal, when necessary, shall be given by alternating waveoff and cut lights.

2. Loss of aircraft radio

   a. Aircraft experiencing loss of radio in the FCLP pattern shall discontinue FCLP and land. The LSO shall signal clearance to land with cut lights.

   b. For outlying field operations, bingo signal shall be given if the controlling LSO wishes the NORDO aircraft to proceed to the primary field as briefed.

   c. LSOs shall notify tower of the NORDO aircraft.

3. No approach lights — Aircraft without approach lights shall be waved off, visually checked for proper landing configuration, and directed to make a full stop landing at night.

4. Aircraft at night with loss of exterior lights — Aircraft without exterior lights shall be directed to make a full stop landing. Other pattern aircraft shall be advised of the position of the darkened aircraft.

7.3 SHIPBOARD EMERGENCIES

Whenever normal operating procedures are modified because of emergencies or malfunctions such as those discussed in the following paragraphs, the pilot shall be informed of existing circumstances and procedures being employed.

7.3.1 Aircraft Emergencies

1. No approach lights — During night operations, aircraft without approach lights shall be waved off for a visual check of landing gear, launch bar/tow link (if applicable), and hook status. The following exceptions apply:

   a. For all multicrew aircraft, except the EA-6B aircraft, where cockpit configuration permits at least two aircrewmembers to visually confirm landing gear indications, verbal confirmation of "gear down and locked" may be substituted for an approach light.

   b. Verbal confirmation of "gear down and locked" may be substituted for an approach light for aircraft in extremis. Prior liaison with the ship's commanding officer shall be accomplished to identify what constitutes an extremis situation.

2. Abnormal aircraft configurations — The LSO shall verify with the pilot the exact configuration, gross weight, and final approach speed of any aircraft approaching in an abnormal configuration. He shall verify the lens setting and the wind-over-deck requirement for the aircraft configuration/approach speed combination. He should also rebrief the pilot concerning any procedures peculiar to the aircraft in its abnormal configuration (i.e., afterburner on touchdown, use of DLC, etc.).

When consulting the ARBs to determine the required head wind, the LSO and Air Officer should *not* as a general rule add 6 knots as recommended as a note in the beginning of each ARB without considering adverse effects of higher wind conditions. Some aircraft in certain abnormal landing configurations have better flight characteristics under lower wind conditions. Higher WOD could be detrimental.

3. Aircraft lighting malfunctions (night) — At night, abnormal aircraft lighting configurations because of lighting or other aircraft malfunctions pose many potential problems for the LSO. These problems may include the following: misidentification or late identification of aircraft type; misidentification of a navigation or other aircraft light as an approach light; inability to confirm aircraft configuration; degradation of depth or range perception, associated with loss of normal visual cues; and effects of autokinesis from a singular aircraft light source. The LSO should be aware of these potential problems and how they may complicate his ability to provide proper control of aircraft. The LSO shall positively confirm aircraft type and configuration if any doubt exists.

For aircraft without any external lights at night, the LSO's ability to provide timely control is severely limited. The decision to recover an aircraft under these circumstances rests solely with the commanding officer.

7.3.2 Landing Aid Malfunctions

WARNING

The range/rate of MOVLAS MK1 Mod2 indications does not accurately represent that of the IFLOLS and may affect the pilot's perception of glideslope.

4. Complete landing aids failure/damage

   a. CARQUALs — Discontinue landings.

   b. Deployed/refresher — The use of a divert field, if available, should be considered. If none are available and aircraft fuel state does not permit delay:

      (1) Establish positive radio contact with each aircraft that is commencing approach

      (2) Primary control is by radio talkdown (PRC-90 if necessary)

      (3) Radio transmission shall be the primary means of waveoff

5. Partial OLS failure/damage

   a. CARQUALs — Discontinue landings.

   b. Deployed/refresher — Rig MOVLAS and continue recovery, with radio as backup.

6. When consecutive aircraft approaches result in above or below glidepath conditions:

   a. CARQUALs — Discontinue landing until a thorough check of OLS settings and monitoring equipment is made.

   b. Deployed/refresher — Rig MOVLAS and continue recovery, with radio as backup. A complete check of the OLS settings and monitoring equipment shall be made immediately upon completion of the recovery.

7. Malfunctioning landing aid stabilization under steady deck conditions

   a. CARQUALs — Discontinue landings.

   b. Deployed/refresher — Rig MOVLAS and continue recovery, with radio as backup.

8. Waveoff lights inoperative

   a. CARQUALs — Discontinue landings.

   b. Deployed/refresher — Continue landings with radio transmission as primary means of waveoff.

7.3.3 Communication Emergencies (General)

Visual communications to be used in the event of radio failure or during EMCON shall be in accordance with the CV NATOPS Manual.

Note

The LSO shall acknowledge control of the approaching aircraft by illuminating the cut lights for 3 seconds at the normal meatball acquisition point. Subsequent illumination of the cut lights indicates to jet/turboprop aircraft that a power addition is required. Immediate power response is mandatory.

7.3.4 Communication Emergencies (Day)

1. Loss of LSO radios

   a. CARQUALs — Discontinue landings. Advise air officer to initiate delta or bingo instructions, as appropriate.

   b. Deployed/refresher — PriFly shall notify aircraft in pattern that LSO radio is out and transmit “Waveoff” if LSO uses waveoff lights.

2. Loss of all ship’s radios

   a. CARQUALs — Discontinue landings. Use visual signals with OLS or from LSO platform to delta or bingo, as appropriate.

   b. Deployed/refresher — Continue landings at the discretion of the OTC.

3. Loss of aircraft radios

   a. CARQUALs with receiver

      (1) Pilot shall be given landing instructions and aircraft shall remain aboard when arrested.

      (2) PriFly shall transmit bingo fuel states each time the aircraft approaches abeam. The pilot shall acknowledge with a wingrock.

      (3) If unable to get aboard, pilot shall initiate own bingo when fuel state dictates. Another aircraft should be designated as an escort.

   b. CARQUALs with no receiver — Aircraft should be diverted.

   c. Deployed/refresher — With or without receiver, make normal approach and landing.

7.3.5 Communication Emergencies (Night)

1. Loss of LSO radios

   a. CARQUALs — Discontinue landings. Give delta or bingo instructions, as appropriate.

   b. Deployed/refresher — The LSO shall inform CCA via sound-powered phone of the radio failure. The LSO shall accept control of each aircraft from CCA via sound-powered phone as the aircraft reaches approximate meatball acquisition position. At this time, CCA shall transmit to the pilot of each aircraft that the LSO has assumed control of the approach and the LSO shall use standard visual signals as necessary.

2. Loss of all ship's radios

   a. CARQUALs — Discontinue landings. The senior officer of each unit airborne should organize a flight of his unit members and proceed to divert field.

   b. Deployed/refresher — Continue landings or bingo at the discretion of the OTC. Use standard visual signals on the OLS, or from the LSO platform, or from PriFly, as appropriate.

3. Loss of aircraft radios

   a. CARQUALs

      (1) Without receiver, pilot should be diverted.

      (2) With receiver, pilot shall be given landing instructions and aircraft shall remain aboard when arrested. CATCC shall transmit bingo fuel state each time the aircraft commences approach. If unable to get aboard, pilot shall bingo when fuel state dictates. Another aircraft should be designated as an escort.

   b. Deployed/refresher — NORDO aircraft with flight leader

      (1) The lead pilot calls "Ball" and receives normal reply from the LSO.

      (2) After receiving acknowledgment, the lead pilot makes the appropriate light signal, breaks off to the left, then parallels final bearing, allowing the NORDO aircraft to continue the approach visually. The NORDO aircraft shall receive cut lights from the LSO following breakaway.

      (3) The lead pilot shall position his aircraft to be rejoined by the NORDO aircraft in the event of a bolter or waveoff.

c. Deployed/refresher — NORDO aircraft without a flight leader

(1) The pilot makes the approach with lights as indicated in the CV NATOPS Manual.

(2) The pilot squawks the appropriate code on IFF.

(3) The LSO shall acknowledge positive control of the NORDO aircraft by the cut light signal. An aircraft with transmitter only receives the same acknowledgment as the NORDO aircraft. Without acknowledgment, the pilot shall execute his own waveoff.

d. Deployed/refresher — NORDO aircraft without external lights and without a flight leader

(1) The pilot shall squawk the appropriate code in IFF and commence a normal approach, but shall not land without visual acknowledgment by the LSO.

(2) If visual acknowledgment is not received, the pilot shall execute a normal waveoff into the bolter pattern and expect pattern priority and acknowledgment on the next approach.

(3) After determining the aircraft will not have any external lights, the senior LSO shall recommend recovery/divert to the air officer.

WARNING

Under these conditions, the LSO's ability to determine aircraft configuration and provide assistance to the approaching aircraft is severely limited. The decision to recover aircraft under these circumstances rests solely with the commanding officer.

(4) The cut lights, when used as an acknowledgment signal, shall be given as near the normal meatball reporting position as possible.

7.3.6 Miscellaneous LSO Equipment Malfunction

The LSO shall notify the air officer of the malfunction or loss of any required equipment listed in Part II, Chapter 4. The decision to continue recovery operations with any required LSO equipment inoperative shall rest with the commanding officer.

7.3.7 Excessive Deck Motion

The decision to continue flight operations during periods of excessive deck motion must be made after considering many factors. These factors include but are not limited to the following: amount and rate of pitch, associated heave and roll, day or night, visibility and horizon, air wing and LSO proficiency, tanker and divert availability. Although there are no hard and fast numbers to define excessive motion, as a general rule, deck motion in excess of 20 feet of pitch in anything less than 5 seconds of periodicity should be viewed as an emergency situation. MOVLAS is the primary method of recovering aircraft during excessive deck motion, depending on other factors previously mentioned. LSO workload will be very high in these conditions. The LSO will most likely be required to make nearly continuous voice transmissions during pitching deck operations regardless of whether MOVLAS or IFLOLS is utilized. The LSO will most likely be required to utilize a steeper than normal glideslope as well as to ensure adequate hook-to-ramp clearance during extreme pitch cycles.

WARNING

- Recovery of fixed-wing aircraft during pitching deck operations has a higher risk of hard landings, ramp strikes, off-center engagements, and in-extremis low fuel states airborne because of inability to get aboard and lower overall boarding rate.
- The range/rate of MOVLAS MK1 Mod2 indications does not accurately represent that of the IFLOLS and may affect the pilot's perception of glideslope

7.3.8 Ship Static Mistrim

Recovery operations shall not be conducted under static mistrim conditions which would result in hook-to-ramp clearances of less than 10 feet for a normal pendant recovery or 8 feet for a barricade recovery. For a pendant recovery, a change in commanded hook touchdown point or, wind permitting, a higher IFLOLS basic angle setting should be considered to correct the low hook to ramp. MOVLAS may also be utilized.

WARNING

Under conditions of significant static roll mistrim, without a defined horizon (night or Case III), pilots may be prone to level their wings with the listing deck and establish an insidious lineup drift during the latter stages of an approach. A lineup drift upon rollout may also be aggravated.

Note

A barricade recovery using IFLOLS glide-slope information under mistrim conditions which preclude targeting of the optimum hook touchdown point reduces the probability of successful engagement. Under these conditions, MOVLAS should be used.

7.3.9 Barricade Engagements

The LSO shall verify with the pilot the exact configuration, gross weight, and final approach speed of the aircraft to engage the barricade. Based upon environmental conditions, he shall recommend to the air officer whether the IFLOLS or MOVLAS should be used for the approach. If the IFLOLS is to be utilized, the LSO shall verify setting of a 4° basic angle, the proper hook touchdown point, and ensure hook-to-ramp clearance is at or above the minimum of 8 feet. Additionally, he shall verify wind-over-deck requirements for the planned gross weight/approach speed combination.

The controlling LSO should brief the pilot concerning the following procedures:

1. Deck motion
2. Wind over deck
3. Importance of lineup/drift control

4. Importance of airspeed control/maximum engaging speed
5. Importance of glideslope control to touchdown
6. Loss of OLS in close (because of barricade stanchions)
7. LSO voice calls
8. Cut
9. Inability to execute late waveoff
10. Four-degree glideslope or MOVLAS (as appropriate).

7.3.10 Pendant Recovery of Aircraft with Loss or Possible Loss of Directional Control

If an aircraft with an emergency that could cause loss of directional control on a bolter (such as unsafe gear or a blown tire) cannot be diverted, and a barricade recovery is not attempted, the following procedures should be executed:

1. Unless ARB or aircraft NATOPS manual directs cross-deck pendant configuration, rig all available cross-deck pendants.
2. If time permits, move all parked aircraft as far from foul lines as practical.
3. Direct all unnecessary personnel to leave the flight deck.
4. Command HTDP to 10 feet prior to the first wire.
5. Select LINE mode for lens stabilization.
6. Recovery Headwind — 30-35 knots.

If ARB data indicates actual recovery headwind allows:

7. Basic Angle — 4°.

WARNING

Changing the commanded HTDP could result in unsafe hook-to-ramp clearance.

PART V

Extreme Weather Condition Operations

CHAPTER 8

Extreme Weather Condition Operations

8.1 DECK MOTION

The decision to conduct flight operations during periods of excessive deck motion must be made after considering many factors. These factors include, but are not limited to the following:

1. Operational necessity
2. Day or night
3. VMC or IMC
4. Amount and rate of pitch, roll, and/or heave
5. Visibility and horizon
6. Air Wing pilot and Staff LSO proficiency
7. Tanker and divert availability

Any number of these factors can combine to create a wide spectrum of operational risk. Measuring operational risk can be difficult, and there are no hard and fast numbers that define "excessive deck motion."

WARNING

- The staff LSO, in conjunction with the Air Officer, shall inform the CV/N Commanding Officer when pitching deck limits are exceeded. The decision to continue flight operations will lie at the discretion of the Commanding Officer.
- Flight operations with ramp movement exceeding 20 feet total is extremely hazardous. Flight operations in these conditions should be avoided.
- Flight operations should not be conducted with deck movement in excess of 35 feet total due to zero hook to ramp clearance with the 4.0 degree glide slope.
- Recovery of fixed wing aircraft with a pitching deck significantly increases the risk of hard landings, ramp strikes, off-center engagements and in-extremis low fuel states airborne due to the inherent decrease in overall boarding rate.

CAUTION

The presence of dutch roll increases the risk associated with the recovery of fixed wing aircraft when compared to pure pitch, and should be taken into careful consideration prior to conducting flight operations.

8.1.1 Flight Operations in Pitching Deck

When deck motion exceeds the stabilization capabilities of the IFLOLS as determined by the Staff LSO (approximately 8 feet of total deck movement in less that 4 seconds), utilization of MOVLAS should be considered for fixed wing aircraft recovery. If the deck is steady for extended periods between deck swings consideration should be given to leaving the IFLOLS rigged and utilize LSO talk-downs during deck swings. This will maximize boarding rates.

Note

IFLOLS Stabilization capabilities are approximate and may vary depending on CV/N.

8.2 ABSENCE OF HORIZON REFERENCE

When environmental conditions at night are such that no visible horizon exists, consideration should be given to utilizing a plane guard destroyer or helicopter aft of the ship to provide a reference point for the LSO. A series of Mk 58 marine markers placed astern of the ship can also provide a useful reference.

Note

Reflection of light from low ceilings may induce pilot vertigo because of the perception of constantly changing horizons.

8.3 RESTRICTED VISIBILITY/CEILING OPERATIONS

Recovery operations with ceilings as low as 200 feet and visibility as low as one-half mile severely limit the time available for the LSO to acquire the approaching aircraft, evaluate aircraft type and configuration, and provide assistance to the pilot. Under extreme low ceiling/visibility conditions, the LSO should use all available means to track and determine aircraft position to facilitate LSO visual acquisition at greater ranges. This may include use of LSO HUD SPN-42/46 information, close attention to CATCC CCA calls for approaching aircraft, and aircraft illumination of landing/taxi lights. The LSO will frequently visually acquire the approaching aircraft prior to the pilot having positive reference to the landing environment (meatball and lineup). Late acquisition of aircraft necessitates that the LSO be prepared to provide immediate, concise, meaningful voice calls to assist the pilot in getting to stabilized approach parameters for recovery.

8.4 EXCESSIVE DECK MOTION

Recovery operations under conditions of excessive deck motion are discussed in Chapter 7 of this manual.

8.5 EXCESSIVE WIND-OVER-DECK OPERATIONS

Turbulence and ramp burble increase significantly with RHW values in excess of optimum, resulting in an increased frequency of high landing gear loading.

WARNING

Excessive crosswinds adversely affect recovery operations. If the recovery crosswinds exceed 7 knots, rates of descent 3 to 6 feet per second in excess of those experienced during normal operations can be expected, even with corrective pilot technique.

Shipboard aircraft recovery operations with recovery crosswinds in excess of 7 knots shall be approved by the ship's commanding officer.

PART VI

Communications

CHAPTER 9

Communications

9.1 GENERAL

The LSO shall possess a thorough knowledge of visual and radio communication procedures as well as complete familiarity with the operation of all available communication equipment, including ACLS data link if applicable. In addition, he should ensure that all pilots under his cognizance are periodically examined on their knowledge of visual communication procedures.

9.2 RADIO COMMUNICATIONS

Under normal recovery conditions, the LSO should restrict his radio transmissions to the minimum necessary to provide positive corrective signals to the pilot during the actual approach. It must be realized, however, that at some times (i.e., initial stages of FCLP, excessive deck motion, restricted ceiling/visibility, etc.) the number of LSO radio transmissions will be greater than normal. Radio communications may be used for airborne brief/debrief at the discretion of the controlling LSO whenever the situation requires it. This includes the pattern and final approach.

The LSO should not permit perceived pressure to maintain total radio silence during EMCON training or ZIP LIP conditions to override his absolute responsibility for the safe recovery of aircraft.

9.3 STANDARD LSO PHRASEOLOGY

The LSO must on occasion use radio transmissions to effect safe aircraft recovery. Calls that are too frequent or verbose actually degrade pilot training and performance. Safety of flight requires that pilots receive short meaningful transmissions that can be instantly understood. Figure 9-1 contains a listing of standard LSO informative, advisory, and imperative phrases.

LSOs shall train pilots on these standard LSO voice calls, their meanings, and the correct response to them. LSOs shall adopt a voice call strategy that is primarily limited, under normal conditions, to the calls listed herein. Such a strategy will reduce pilot confusion or misinterpretation of any nonstandard calls.

9.4 RADIO COMMUNICATIONS DURING EMERGENCY SITUATIONS

During emergency situations such as loss of visual landing aids, reduced cockpit visibility, excessive deck motion, etc., the LSO will often be required to give pilots a complete radio talkdown, providing lineup, glideslope, and corrective information. The LSO should brief the pilots as time permits on format for the talkdown as well as expected pilot responses to calls.

INFORMATIVE CALLS

Used to inform pilots of existing situations.

TRANSMISSION	MEANING	RESPONSE (Aircraft in Manual Mode)	RESPONSE (Aircraft in APC Mode)
"You're (a little) high."	Aircraft is (slightly) above optimum glide-slope.	Adjust sink rate with power/nose attitude to establish center ball.	Adjust sink rate with nose attitude to establish center ball. (Avoid using in close.)
You're (a little) low."	Aircraft is (slightly) below optimum glide-slope.	Adjust glide slope immediately.	Adjust glide slope immediately.
"You're going high (low)."	Unless corrected, aircraft will go above (below) optimum glide-slope.	Adjust sink rate with power/nose attitude to maintain center ball.	Adjust sink rate with nose attitude to maintain center ball.
"You're on centerline."	Self-explanatory.	N/A	N/A
"You're on glideslope/glidepath."	Self-explanatory.	N/A	N/A
"You're on speed."	Self-explanatory.	N/A	N/A
"You're lined up left/right."	Aircraft has undershot/overshot centerline.	Reestablish centered lineup.	Reestablish centered lineup.
"You're drifting left/right."	Aircraft is drifting left/right of center-line.	Correct lineup to centerline.	Correct lineup to centerline.
"You're (a little fast/slow)." (To be followed by "Go manual" if auto.)	Self-explanatory.	Adjust nose attitude/power to establish optimum AOA.	APC is not maintaining aircraft at optimum AOA. Disengage APC and adjust power/attitude to maintain optimum AOA.
"Roger Ball" ("Auto"/"Coupled" as appropriate).	LSO acknowledges pilot has meatball acquisition, lineup reference, and angle of attack.	N/A	N/A
"Paddles contact."	LSO assuming control from CCA.	N/A	N/A
"Continue."	LSO acknowledges CLARA call but is not able to assume control from CCA	Continue approach to minimums	Continue approach to minimums
"The deck is moving down/up (a little)."	OLS information may be invalid (to be followed by advisory/imperative calls).	Adjust power and attitude under LSO guidance.	Adjust attitude under LSO guidance.
"The deck is steady."	OLS information is valid	Fly normal approach.	Fly normal approach.
"Winds are (slightly) starboard/port/axial."	Self-explanatory.	Monitor lineup to maintain centerline.	Monitor lineup to maintain centerline.
"You're underpowered/ overpowered."	Self-explanatory.	Adjust attitude and power as required.	Not used.
"Ship's in a starboard/port turn."	Self-explanatory.	Adjust lineup as necessary.	Adjust lineup as necessary.
"MOVLAS recovery."	MOVLAS is in use.	Fly published pattern altitude until "Roger ball" received.	Fly published pattern altitude until "Roger ball" received.

Figure 9-1. Standard Radio Phraseology (Sheet 1 of 4)

ADVISORY CALLS

Used to direct pilot's attention to potential difficulties and prevent possible control errors.

TRANSMISSION	MEANING	RESPONSE (Aircraft in Manual Mode)	RESPONSE (Aircraft in APC Mode)
"Keep your turn in."	If angle of bank is not adjusted, the aircraft will overshoot the centerline.	Adjust angle of bank.	Adjust angle of bank.
"Check your lineup." (Start only.)	Aircraft lineup is not optimum.	Correct lineup drift or position to maintain aircraft on centerline.	Correct lineup drift or position to maintain aircraft on centerline.
"Back to the right/left."	Aircraft is drifting such that if drift is not corrected, it will overshoot the centerline.	Correct lineup drift to remain on centerline.	Correct lineup drift to remain on centerline.
"Don't settle." "Don't go low."	Aircraft will settle below optimum glideslope if not corrected.	Check sink rate and meatball to avoid settling below glideslope.	Check sink rate and meatball to avoid settling below glideslope.
"Don't climb." "Don't go high."	Aircraft is on or above optimum glideslope with insufficient rate of descent to maintain constant glideslope.	Adjust power/attitude to stop the ball from rising.	Adjust power/attitude to stop the ball from rising.
"Don't go any lower (higher)."	Aircraft is maintaining position well below (above) optimum glideslope with insufficient or no correction.	Adjust power/attitude to make positive correction toward optimum glideslope.	Adjust attitude to make positive correction toward optimum glideslope.
"Don't chase it"	Advises pilot the deck is moving up/down and may present an illusion of a climb or descent	Disregard deck motion and adjust power/attitude to maintain rate-of-descent and optimum airspeed.	Disregard deck motion and adjust power/attitude to maintain rate-of-descent and optimum airspeed.
"Hold what you've got."	OLS information is invalid. Present rate-of-descent is correct to maintain proper glideslope.	Adjust power/attitude. Hold present rate-of-descent and optimum airspeed.	Adjust attitude. Hold present (optimum) rate-of-descent.
"Fly the ball."	OLS information is valid.	Scan the lens and adjust power/attitude to maintain optimum glideslope.	Scan the lens and adjust attitude to maintain optimum glideslope.
"Easy with it."	Magnitude of power correction immediately preceding this transmission is excessive.	Reduce magnitude of power correction to intercept and reestablish optimum glideslope and airspeed.	Reduce magnitude of nose attitude correction to intercept and reestablish optimum glideslope and airspeed.
"Easy with your nose."	Magnitude of nose attitude correction immediately preceding this transmission is excessive.	Reduce magnitude of nose attitude correction to establish optimum aircraft attitude.	Not used.
"Easy with your wings."	Magnitude of lineup correction immediately preceding this transmission is excessive.	Reduce magnitude of lineup correction to intercept and reestablish centerline.	Reduce magnitude of lineup correction to intercept and reestablish centerline.

Figure 9-1. Standard Radio Phraseology (Sheet 2)

IMPERATIVE CALLS

Used to direct the pilot to execute a specific control action. MANDATORY IMMEDIATE RESPONSE

TRANSMISSION	MEANING	RESPONSE (Aircraft in Manual Mode)	RESPONSE (Aircraft in APC Mode)
"A little power."	Aircraft is decelerating or settling.	Correct with power.	Not used.
"Power back on."	Pilot has made an excessive power reduction.	Add power to maintain optimum glideslope/AOA.	Disengage APC. Add power to maintain optimum glideslope/AOA.
"Power."	Aircraft is low/slow.	Add power.	Disengage APC. Refer to Note.
"Burner."	Aircraft is extremely underpowered or in extremis.	Select afterburner power.	Select afterburner power.
"Go manual."	Disengage APC.	Not used.	Disengage APC. Refer to Note.
"Attitude." ("A little attitude.")	Manual: Aircraft nose is low. Auto: Aircraft is low/setting or nose is low.	Increase nose attitude (slightly) to establish landing attitude.	Increase nose attitude (slightly) to reduce sink rate or to establish landing attitude.
"(A little) right/left rudder."	Aircraft does not have enough right or left rudder and will land yawed right or left if not corrected.	Adjust rudder to return aircraft to balanced flight.	Not applicable.
"(A little) Right for lineup." "(A little) Come left."	Aircraft will land left/right if not corrected.	Correct lineup to centerline, then level wings.	Correct lineup to centerline, then level wings.
"Bolter."	Self-explanatory.	Execute bolter in accordance with model NATOPS manual.	Execute bolter in accordance with model NATOPS manual.
"Waveoff" or "Waveoff, foul deck."	Self-explanatory.	Execute waveoff in accordance with model NATOPS manual.	Execute waveoff in accordance with model NATOPS manual.
"Waveoff up the starboard side."	Discontinue turning attempt to overfly the landing area.	Execute waveoff in accordance with model NATOPS manual starboard of the landing area (island).	Execute waveoff in accordance with model NATOPS manual starboard of the landing area (island).
"Cut."	Aircraft is in a position to land.	For barricade recovery, retard throttle(s) to idle and secure engine(s) once safely on deck.	For barricade recovery, retard throttle(s) to idle and secure engine(s) once safely on deck.
"Speedbrakes."	Speedbrakes are extended.	Retract speedbrakes.	Retract speedbrakes.
"Extend speedbrakes."	Self-explanatory.	Comply.	Comply.

Figure 9-1. Standard Radio Phraseology (Sheet 3)

IMPERATIVE CALLS (Cont.)

TRANSMISSION	MEANING	RESPONSE (Aircraft in Manual Mode)	RESPONSE (Aircraft in APC Mode)
"Drop your hook."	Self-explanatory.	Comply.	Comply.
"Drop your gear."	Self-explanatory.	Comply.	Comply.
"Drop your flaps."	Self-explanatory.	Comply.	Comply.
"Level your wings."	Aircraft is in angle of bank.	Comply.	Comply.
"Downgrade."*	Disengage ACLS.	Disengage ACLS.	Disengage ACLS.
"Climb."	Aircraft has boltered/waved off but has not established proper attitude/power for positive rate of climb.	Adjust nose attitude to optimum, level wings, and maintain MRT (afterburner if required) to establish positive rate of climb.	

Note

* Aircraft is considered to be in manual mode immediately after the "Downgrade" call. Manual calls/responses are subsequently applicable.

Figure 9-1. Standard Radio Phraseology (Sheet 4)

PART VII

NATOPS Evaluation, Pilot Performance Records, and Aircraft Mishap Statements

CHAPTER 10

NATOPS Evaluation

10.1 INTRODUCTION

10.1.1 Concepts

The standard operating procedures prescribed in this manual optimize the safety and efficiency of LSO operations. The NATOPS evaluation is intended to evaluate compliance with NATOPS procedures by observing and grading individuals and units. This evaluation is tailored for compatibility with various operational commitments and missions of both Navy and Marine Corps units. The primary objective of the NATOPS evaluation program is to assist the type commander LSO in improving LSO readiness and safety through constructive comment. Maximum benefit from the NATOPS evaluation program will only be achieved through the active, vigorous support of all LSOs.

10.1.2 Implementation

The type commander LSO shall supervise the implementation of the NATOPS qualification and evaluation program. Individual evaluations are a prerequisite to certification for each level of LSO qualification. Unit evaluations shall be conducted by the type commander LSO during the normal carrier workup cycle prior to extended deployment. Instruction in, and adherence to, NATOPS procedures is the responsibility of the senior cognizant LSO, and should be on a routine basis within each unit to obtain maximum benefits from the program.

10.2 FIELD LSO QUALIFICATION

10.2.1 Formal Ground Training

Prior to certification for field qualification, the LSO trainee should complete initial formal ground training at the U.S. Navy LSO School. The trainee shall receive instruction in the following subject areas from a designated LSO:

1. Operation of the Mk 8 Mod 1 Fresnel lens
2. Operation of Mk 8 Mod 0 Fresnel lens or Mk 9/10 mirror systems (if installed at the command's primary FCLP facilities)
3. Operation of MOVLAS and MOVLAS technique (if installed at the command's primary FCLP facilities)
4. Glideslope geometry/hook touchdown point calculations for field equipment, and FLOLS pole check procedures.
5. Operation of UHF communications equipment at command's primary FCLP facilities
6. Shore-based arresting gear
7. Aircraft shore-based emergency landing characteristics/procedures (for each type/model aircraft operated by command)
8. Course rules/FCLP procedures for command's primary FCLP facilities.

10.2.2 Field Experience

The LSO under training shall receive sufficient field training under the supervision of a designated LSO to ensure the LSO under training can safely control day/night FCLP operations. He should also receive training in control of aircraft using MOVLAS (if available).

10.2.3 Field Evaluation

A designated LSO shall evaluate the LSO under training's ability to safely control day/night FCLP operations (using both the normal lens/mirror, LSO talkdowns, and MOVLAS if available) prior to certification.

10.2.4 Certification

Based upon a favorable evaluation from the senior squadron LSO and concurrence from the air wing LSO/Marine air wing LSO, the air wing commander/Marine air wing commander may grant field LSO qualifications. A copy of the approval letter shall be forwarded to the type commander. The letter shall include a statement that the LSO has completed initial formal ground training or has received instruction in the required subject areas specified in paragraph 10.2.1.

10.3 SQUADRON LSO QUALIFICATION

10.3.1 Formal Ground Training

The LSO should complete initial formal ground training at the U.S. Navy LSO School prior to qualification as a squadron LSO. The LSO shall receive instruction in the following subject areas from a designated LSO prior to certification as a squadron LSO:

1. Required formal ground training for field qualification
2. CV and LSO NATOPS Manuals
3. Aircraft launch procedures and recovery bulletins
4. LSO shipboard workstation and equipment
5. AN/SPN-41 and AN/SPN-42/46
6. PLAT/ILARTS
7. Catapults and arresting gear
8. Barricade
9. MOVLAS technique
10. Glideslope geometry/hook touchdown point calculations
11. Received training in LSO trainer (device 2H111) (as available)
12. Pilot debriefing techniques
13. APARTS computer program
14. LSO recordkeeping and trend analysis.

10.3.2 Shipboard Experience

The LSO under training shall receive sufficient training under the supervision of a wing-designated LSO to ensure the LSO under training can safely control shipboard recovery of one or more type aircraft under the following conditions:

1. Day and night operations
2. Relatively steady deck
3. Fresnel lens and MOVLAS (daylight operations).

10.3.3 Written and Practical Evaluation

The LSO shall complete a written evaluation covering all areas of formal ground training listed in this chapter and administered by the senior air wing staff LSO prior to certification. Additionally, the senior staff LSO shall evaluate the LSO's ability to safely control day/night FCLP and day/night shipboard recovery of aircraft using both the Fresnel lens and MOVLAS (daylight). Night shipboard recovery operations are not required for squadron qualification in C-2 type aircraft.

10.3.4 Certification

Once the above training requirements have been successfully completed, and based upon a favorable evaluation from the senior staff LSO, the air wing commander shall submit a letter recommending squadron qualification to the type commander. The letter shall include a statement indicating that the LSO has completed initial formal ground training or has received instruction in the required subject areas specified in paragraph 10.3.1. The type commander shall forward a copy of the approval letter to the Bureau of Naval Personnel (PERS 433) or Commandant of the Marine Corps (Code MMOA2) for entry into the individual's permanent record.

10.4 WING LSO QUALIFICATION

10.4.1 Formal Ground Training

The LSO shall complete the initial formal ground training syllabus of the U.S. Navy LSO School prior to wing LSO qualification.

10.4.2 Shipboard LSO Experience

The LSO under training shall receive sufficient training under the supervision of the senior air wing staff LSO to ensure that individual's ability to control a majority of the air wing aircraft aboard ship in day/night and all weather and deck conditions, without assistance, using the Fresnel lens, MOVLAS, and LSO talkdowns.

10.4.3 Written and Practical Evaluation

The LSO shall complete a written evaluation covering the subject areas discussed in the initial formal ground training syllabus and administered by the senior air wing staff LSO prior to certification. The senior staff LSO shall evaluate the LSO's ability to safely control FCLP and shipboard recovery of air wing aircraft and function as a watch team leader instructing proper control techniques and platform strategy.

10.4.4 Certification

Once the above training requirements have been successfully completed, and based upon a favorable evaluation from the senior staff LSO, the air wing commander shall submit a letter recommending wing qualification to the type commander. The letter shall include a statement indicating that the LSO has completed initial formal ground training. The type commander shall forward a copy of the approval letter to the Bureau of Naval Personnel (PERS 433) or Commandant of the Marine Corps (Code MMOA2) for entry into the individual's permanent record.

10.5 TRAINING LSO QUALIFICATION

10.5.1 Prerequisites

The LSO shall have, as a minimum, a Wing LSO Designation prior to commencing training for a FRS or CNATRA training LSO qualification.

Note

A Squadron LSO designation will suffice for commencing training for a CNATRA Training LSO qualification.

10.5.2 Formal Ground Training

The LSO shall complete the initial formal ground training and FRS/TRACOM formal ground training courses of the U.S. Navy LSO School prior to training LSO qualification.

10.5.3 Classroom Training Experience

Prior to certification of training LSO qualification, the LSO shall demonstrate the ability to present the precarrier briefing syllabus to pilots undergoing initial in-type carrier qualification.

10.5.4 Field Experience

Prior to certification of training LSO qualification, the LSO shall demonstrate the ability to safely control day/night FCLP operations and conduct effective postflight debriefs with pilots preparing for initial in-type carrier qualification.

10.5.5 Shipboard Experience

Prior to certification of training LSO qualification, the LSO shall demonstrate, under the supervision of a training LSO, the ability to safely control day/night initial in-type carrier qualification landings and conduct effective postflight debriefs.

Note

Control of night carrier landings is not required for training LSO qualification for aircraft types whose mission does not require night carrier operations.

10.5.6 Certification

Upon satisfactory evaluation and recommendation by the senior training LSO, the squadron commanding officer shall recommend training qualification via letter to the type commander (training command squadron commanding officers shall forward letters to the type commander, via the training wing commander). The type commander shall forward a copy of the approval letter to the Bureau of Naval Personnel (PERS 433) or Commandant of the Marine Corps (Code MMOA2) for entry into the individual's permanent record.

10.6 STAFF LSO QUALIFICATION

10.6.1 Formal Ground Training

The LSO shall complete the advanced formal ground training syllabus of the U.S. Navy LSO School prior to staff LSO qualification.

10.6.2 Shipboard Currency

Prior to certification of staff LSO qualification, the LSO shall demonstrate, under the supervision of a staff LSO, proficiency in safely controlling all air wing aircraft aboard ship in day/night and all weather and deck conditions, without assistance, using the Fresnel lens, MOVLAS, and LSO talkdowns.

10.6.3 Certification

Upon satisfactory evaluation and recommendation by the senior staff LSO, the air wing commander shall recommend staff qualification via letter to the type commander. The type commander shall forward a copy of the approval letter to the Bureau of Naval Personnel (PERS 433) for entry to the individual's permanent record.

10.7 CARRIER AIR WING PREDEPLOYMENT LSO EVALUATION

10.7.1 General

In supervising the implementation of the NATOPS qualification and evaluation program, the cognizant type commander LSO shall evaluate the LSO training program and team performance of each carrier air wing prior to extended deployment. Training air wings, reserve air wings, and fleet readiness squadrons shall be evaluated at least every 18 months.

10.7.2 Formal Ground Training Program Evaluation

The type commander LSO shall administer a written examination to all trainee, squadron, wing, training, and staff LSOs covering appropriate material from the initial and advanced formal ground training syllabi and aircraft recovery bulletins appropriate to the specific ship and aircraft of the embarked air wing. Designated LSOs shall demonstrate a working knowledge of the examination material commensurate with their level of designation. Failure to do so may result in revocation of LSO designation at the discretion of the type commander LSO.

10.7.3 Shipboard LSO Team Performance Evaluation

The type commander LSO shall evaluate the ability of the air wing's LSOs to safely and expeditiously control shipboard recovery of aircraft in day/night and all weather and deck conditions using the Fresnel lens, MOVLAS, and LSO talkdowns.

10.8 LSO TRAINING STATUS MATRIX

The LSO training status matrix (see Figures 10-1 and 10-2) shall be completed by the senior air wing LSO, TRAWING LSO, FRS LSO, or Marine air wing LSO on a quarterly basis. The matrix is due to the type commander LSO with a copy to Bureau of Naval Personnel (PERS 433) (or Marine liaison officer, U.S. Navy LSO School for Marine LSOs); CNATRA (Code N333); and OIC, LSO School, on the 15th of January, April, July, and October. The remarks/recommendations column is used to identify LSOs that are particularly qualified to advance in the LSO pipeline. Comments should include estimation of further qualification, identification of problem areas, and recommendation for future assignment. The senior LSO should debrief individual LSOs on their progress toward further qualification at least on a quarterly basis.

10.9 REMOVAL OF LSO DESIGNATION

When it is necessary to remove an LSO's designation, the senior cognizant LSO shall make a recommendation to the LSO's commanding officer. If the LSO's commanding officer concurs in the recommendation, a letter shall be forwarded via the chain of command to the Bureau of Naval Personnel (PERS 1651) or Commandant Marine Corps (Code MMOA2) requesting such action. Commanding officers shall cite the reasons for removing the LSO's designation.

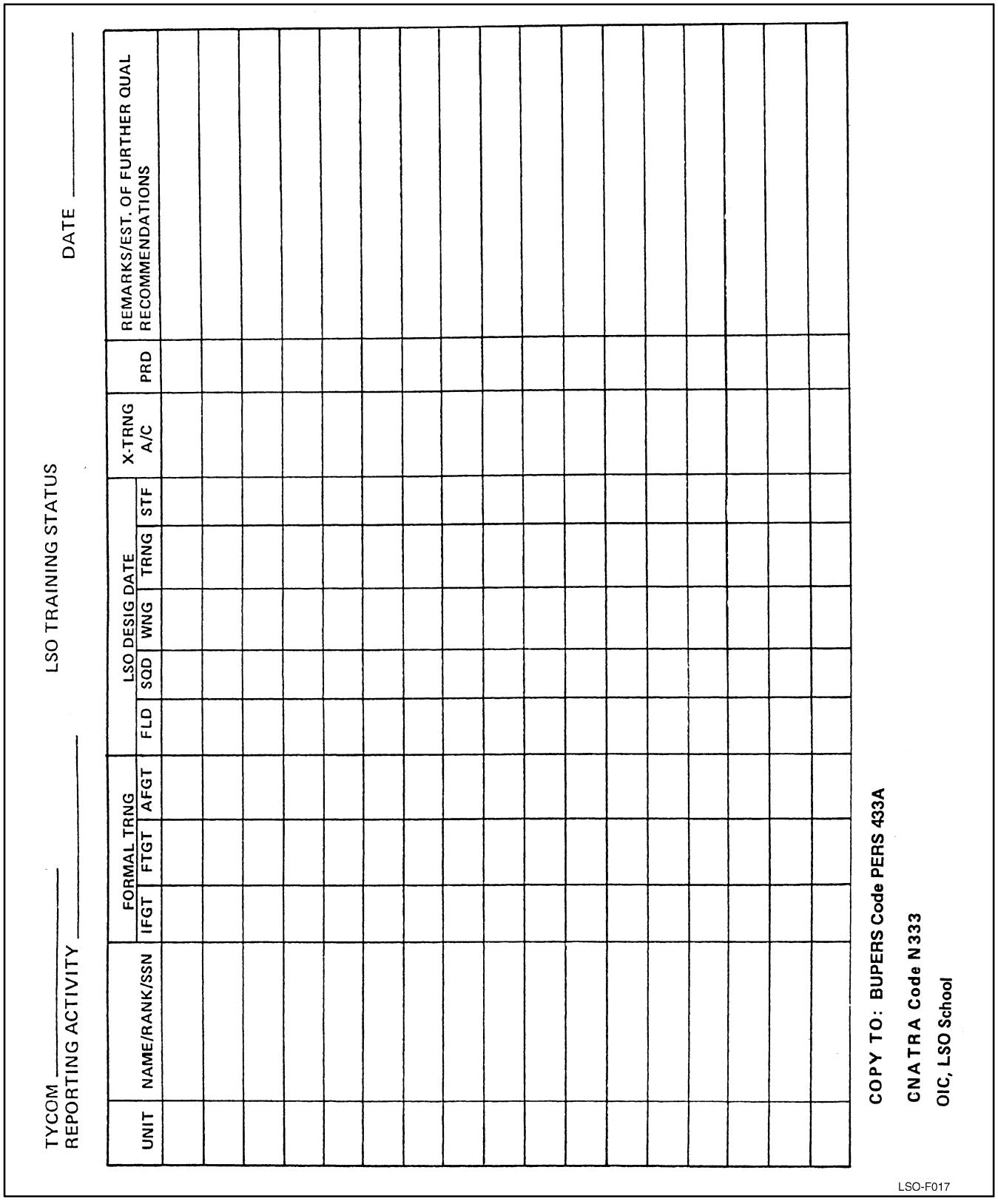

Figure 10-1. LSO Training Status Matrix

TYCOM CNAP
REPORTING ACTIVITY CVW-2

LSO TRAINING STATUS

DATE 15 JAN 88

UNIT	NAME/RANK/SSN	FORMAL TRNG			LSO DESIG DATE					X-TRNG A/C	PRD	REMARKS/EST. OF FURTHER QUAL RECOMMENDATIONS
		IFGT	FTGT	AFGT	FLD	SQD	WNG	TRNG	STF			
CVW-2	BALL, RE LCDR 226-88-9125	2/79	12/81	5/86	4/79	6/80	8/81	3/82	6/86	F/A 18 6/84	12/88	DESIRES CNAP LSO JOB
VF-1	KNOTS, M.X. LT 541-58-1695	3/85			5/85	8/86					3/88	BEST SQD LSO. EXPECT WING QUAL. 1/88. MOST FOR FRS
VA-145	SLACK, T.M. LT 659-23-9854	8/85			8/85	8/86					6/88	AVG LSO. DO NOT ANTICIPATE WING QUAL.
VAW-112	CRUISE, T.A. LT 569-42-9875	1/86			2/86	4/87					8/88	AVG LSO. DESIRES TO HANG UP PADDLES. DESIRES PG SCHOOL

LE BALL
LCDR

COPY TO: BUPERS Code PERS 433A

CNATRA Code N333

OIC, LSO School

LSO-F016

Figure 10-2. Example LSO Training Status Matrix

CHAPTER 11

Pilot Performance Records

11.1 INTRODUCTION

The effectiveness and combat readiness of the aircraft carrier depends on the overall efficiency of carrier landing operations. To effectively carry out assigned missions, each aviator must be able to perform a carrier approach and landing within the standards set for this evolution. The cognizant commanding officer and air wing commander shall be immediately informed about those pilots who display unsafe practices or unsatisfactory progress. The LSO shall recommend to the commanding officer or air wing commander either additional field/carrier work or immediate grounding and evaluation of those individual pilots concerned.

11.2 LOG BOOKS

The controlling LSO shall maintain a field and carrier logbook. Comments should be sufficiently detailed to enable the LSO to give a comprehensive debrief to the pilots concerned. The Landing Signal Officer's Log, OPNAV 3760/76 (5-87) (S/N 0107-LF-037-6390), may be used for documentation.

The Senior Air Wing Staff LSO shall ensure that all COD shipboard approaches are logged in a separate COD log maintained in the Air Operations office on board the ship.

11.3 PILOT PERFORMANCE RECORDS

The LSO shall keep a smooth carrier landing trend analysis for all pilots making carrier landings in aircraft for which his command is reporting custodian, using OPNAV Form 3760/71 (Figure 11-1) or by using the APARTS (Figure 11-2). The pilot performance record should be updated daily, reviewed and debriefed routinely, and the pilot and his commanding officer notified of any unsatisfactory trends. LSO logbooks and pilot performance records are privileged and personal documents. Extracts from them are authorized for official use provided they are interpreted and compiled by the LSO concerned.

11.3.1 Automated Performance Assessment and Readiness Training System (APARTS)

APARTS is a computer software program designed to assist the LSO in recording and analyzing pilot and LSO carrier landing performance information. The system provides various summaries for individual pilots, squadrons, or an entire air wing. The results may be displayed on the computer screen or printed out for a hard copy record (Figure 11-2). Copies of fleet and FRS APARTS programs, including operating manuals, may be obtained from the U.S. Navy LSO School.

11.4 STANDARD LOG SYMBOLS

The following symbols are in common use for recording comments concerning approaches/landings during FCLP and carrier operations. The symbols used in APARTS are also listed. If there is no corresponding APARTS symbol, the space is left blank.

CARRIER LANDING TREND ANALYSIS
OPNAV FORM 3760/71 (Rev. 7-71)

YEAR 1990 ACFT F-18 SQUADRON VFA-00 SHIP CV-00 PILOT ROGER BALL

DATE	D N	GR	GLIDESLOPE & SPEED ERRORS .75	OT	X	IM	IC	AR	CONTROL ERRORS POWER	ATTITUDE	LINE UP AND WINGS	WIRES	REMARKS - INCLUDE USE OF APC AND AWCLS
6/2	DN	(OK)		H		(H)				(NOTL)		1 2 3 4	A
6/2	DN	WO					DEC CD		NEPIC			1 2 3 4	
6/3	DN	(OK)					SRD	D		DNTL		1 2 3 4	
6/4	DN	OK									(DLIC)	1 2 3 4	
6/6	DN	(OK)	H								RUFWIC	1 2 3 4	
6/7	DN	OK										1 2 3 4	
6/7	DN	(OK)	(GA)					(HF)	OCCO			1 2 3 4	
6/8	DN	C				(H)	CD →		EG			TD 2 3 4	LANDED ON WO
6/8	DN	I			(LO)			(LOB)				1 2 3 4	I
6/9	DN	I	HF								LULX-IM	1 2 3 4	
6/15	DN	WO										1 2 3 4	LIG
6/15	DN	OK			(OK)			(L)			(OSX)	1 2 3 4	
6/16	DN	(OK)	NEP S			LO → OC S	H		NEPMW			1 2 3 4	
6/16	DN	I						(H)				1 2 3 4	
6/18	DN	I				SRD	H					1 2 3 4	
6/18	DN	(OK)			SLO		F →				NDIC	1 2 3 4	
6/18	DN	I					TMP	B	TMPIC	:0		1 2 3 4	
6/20	DN	(OK)			AA		ACC				DRWMR	1 2 3 4	TWA
	DN										AA	1 2 3 4	
	DN											1 2 3 4	
	DN											1 2 3 4	
	DN											1 2 3 4	
	DN											1 2 3 4	

LSO-F018

Figure 11-1. Example Carrier Landing Trend Analysis Form

SQUADRON: ALL TREND ANALYSIS	AIRCRAFT: ALL
RECOVERY PERIOD: 9006021200 - 9006201200	DAY/NITE/ALL: ALL
PILOTS SELECTED: BALL, ROGER	MOVLAS: ALL RECOVERIES

	GLIDE SLOPE AND SPEED ERRORS						CONTROL ERRORS				
DATE	GRADE	AW	X	IM	IC	AR	POWER	ATT	LINEUP & WING	OTHER	WIRE #
06/02D	(OK)		H	(H)				(NDTL)			2
06/02N	WO				DEC	CD	NEPIC				WO
06/02N	(OK)				SRD	B		DNTL			4
06/04D	OK								(DLIC)		3
06/06D	(OK)	H							RUFWIC		4
06/07D	OK					(B)					4
06/07D	(OK)	(SLO)				(/)	OCCOIC				4
06/08D	C			OC(H)	CD	CD	_EGIC_ EGAR			.	T1
06/08N	M1		(LO)			(LO) (B)					2
06/09D	—	H F							LULX LULIM		4
06/15D	WO		LIG								WO
06/15D	OK					(S)			(OSX)		2
06/16D	(OK)		S	LO	LO		NEPAW				1
06/16N	B			OCS	H	^				^AR	B
06/16N	—			SRD	H	\		NDIC			1
06/18D	(OK)		OCSLO		F	F					3
06/18N	—					B	TMPIC		DRWAR LRWDIW		4
06/20D	(OK)				ACC				AA		2

TOTAL # OF APPROACHES – 18

Figure 11-2. APARTS Trend Analysis

11.4.1 General Symbols

SYMBOL	APARTS SYMBOL	MEANING
WO	WO	Waveoff
WOP	WOP	Waveoff Pattern
OWO	OWO	Own Waveoff
TWO	TWO	Test Waveoff
TLU	TLU	Test Lineup
OK	_OK_	Perfect pass
OK	OK	Reasonable deviations with good corrections
(OK)	(OK)	Fair. Reasonable deviations
—	--	No-grade. Below average but safe pass
C→	C	Cut. Unsafe, gross deviations inside waveoff window
B↗	B	Bolter
NC	NC	No count (used in grade column)
( )	( )	Parentheses around any symbol signifies “a little” (e.g., (F) means “a little fast”)
_____	_Comment_	Underline. For emphasis
PATT	PATT	Pattern
(A)	(A)	APC/Auto

		APC/Auto downgraded to manual
|	M1	Mode I ACLS (record in grade column)
		Mode I ACLS, uncoupled after the ball call
•	•	A dot between two symbols indicates "on" (e.g., S• LUIC)
—	-	A dash between two symbols indicates "to" (e.g., HIM-IC)
SQUARE	Comment [ ]	A square around any symbol indicates that a signal was not answered
CIRCLE	Comment ( )	A circle around any symbol indicates that a signal was answered too slowly
	OC	When used as a prefix to any symbol, " " indicates "over controlled"

11.4.2 Descriptive Symbols

SYMBOL	APARTS SYMBOL	MEANING
AA	AA	Angling approach
ACC	ACC	Accelerate
AFU	AFU	All "fouled" up
B	B	Flat glideslope
	C	Climbing
CB	CB	Coming back to lineup
CD	CD	Coming down

CH	CH	Chased
CO	CO	Come-on
CU	CU	Cocked up
DD	DD	Deck down
DEC	DEC	Decelerate
DL	DL	Drifted left
DN	DN	Dropped nose
DR	DR	Drifted right
DU	DU	Deck up
EG	EG	Eased gun
F	F	Fast
FD	FD	Fouled deck
GLI	GLI	Gliding approach
H	H	High
HO	HO	Hold off
LIG	LIG	Long in the groove
LL	LL	Landed left
LLU	LLU	Late lineup
LO	LO	Low
LR	LR	Landed right
LTR	LTR	Left to right
LU	LU	Lineup
LUL	LUL	Lined up left
LUR	LUR	Lined up right

LWD	DLW	Left wing down
N	N	Nose
NC	NC	Nice correction
ND	ND	Nose down
NEA	NEA	Not enough attitude
NEP	NEP	Not enough power
NERD	NERD	Not enough rate of descent
NERR	NERR	Not enough right rudder
NESA	NESA	Not enough straight away
NH	NH	No hook
NSU	NSU	Not set up
OR	OR	Overrotate
OS	OS	Overshoot
OSCB	OSCB	Overshot coming back
P	P	Power
PD	PD	Pitching deck
PNU	PNU	Pulled nose up
ROT	ROT	Rotate
RUD	RUD	Rudder
RUF or ∿	RUF	Rough
RWD	DRW	Right wing down
RR	RR	Right rudder
RTL	RTL	Right to left

S	S	Settle
SD	SD	Spotted deck
SHT	SHT	Ship's turn
SKD	SKD	Skid
SLO	SLO	Slow
SRD	SRD	Stopped rate of descent
ST	ST	Steep turn
TCA	TCA	Too close abeam
TMA	TMA	Too much attitude
TMP	TMP	Too much power
TMRD	TMRD	Too much rate of descent
TMRR	TMRR	Too much right rudder
TTL	TTL	Turned too late
TTS	TTS	Turned too soon
TWA	TWA	Too wide abeam
W	W	Wings
WU	WU	Wrapped up
XCTL	XCTL	Cross control
	^	Over the top
	LLWD	Landed left wing down
	LRWD	Landed right wing down
	LNF	Landed nose first

	3PTS	Landed 3 points
	/	Fly through the glideslope (going up)
	\	Fly through the glideslope (going down)

11.4.3 Symbol Suffixes

SYMBOL	APARTS SYMBOL	MEANING
CCA	CCA	Carrier controlled approach
OT	OT	Out of turn (as aircraft rolls wings level)
BC	BC	Ball call
X	X	At the start (first one-third of glideslope)
IM	IM	In the middle (middle one-third of the glideslope)
IC	IC	In close (last one-third of glideslope)
AR	AR	At the ramp
TL	TL	To land
IW	IW	In the wires
AW	AW	All the way

CHAPTER 12

Aircraft Mishap Statements

12.1 GENERAL

It is incumbent upon the LSO to prepare detailed and complete statements regarding aircraft mishaps. It is recognized that the LSO is usually in the best position to evaluate incidents culminating in carrier landing mishaps. The following is an outline of items that are pertinent to most CV landing mishaps. These items should be used, when applicable, in the preparation of LSO statements to aircraft mishap investigation boards. Controlling LSOs shall be afforded access to the PLAT/ILARTS tape (with sound) prior to preparing their statements.

12.1.1 LSO Mishap Statement

1. Narrative

   a. State, as you saw them, the events as they occurred.

   b. Include an explanation of your actions.

2. Environmental Factors

   a. Weather — Include both observed and LSO-called.

   b. Deck conditions — Include list, dutch roll, deck movement in feet, periodicity, and heave.

   c. Wind — Both direction and velocity, gusts, wind shifts, shears, sink holes, turbulence in the groove, and crosswind component.

   d. LSO equipment — State what was working or inoperative, and if all problems were passed to the air officer. State if any of the inoperative gear could have had an effect on the recovery.

   e. LSO horizon — State what was being used as a horizon reference (destroyer position, flares, helo, nothing, etc.).

   f. OLS — Intensity setting, lens settings, and status of deck and drop lights.

3. Air Operations

   a. Had the LSO advised to cancel flight operations prior to the mishap?

   b. Were air operations canceled after the mishap?

4. LSO Data

   a. Type qualification, date received, aircraft qualified to wave at the field or ship, and day, night, and MOVLAS experience.

   b. Date of last formal training.

c. Time in LSO duty status for that day, physical condition, and fatigue factor.

d. Warfare specialty, type aircraft qualified in as a pilot.

e. Any other aircraft qualified in as a pilot, cross-trained in, or received familiarization/orientation flights in.

5. Pilot Performance

a. Updated trend analysis from squadron LSO.

b. Narrative of the pilot's specific trends.

c. Comparison of pilot's performance to that of his experience-level peers.

Note

An Embarked Landing Hazard Report shall be submitted utilizing the format contained in OPNAVINST 3750.6 anytime any part of the landing aircraft impacts on or below the round down, personnel, or equipment in the landing area, or for any other occurrences considered appropriate.

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